AUTOMOTIVE INDUSTRIES

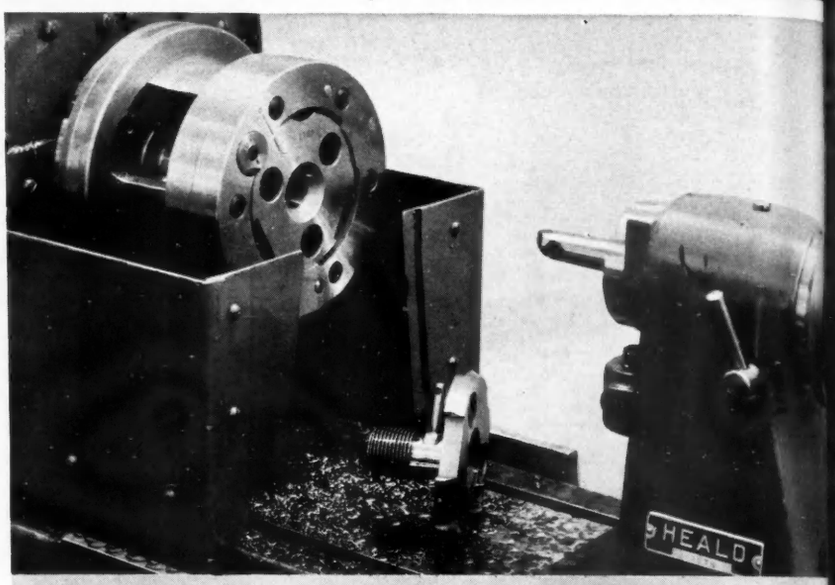
LAND — AIR — WATER

APRIL 24, 1937

Cylinders PRECISION FINISHED on *Heald* BORE-MATICS

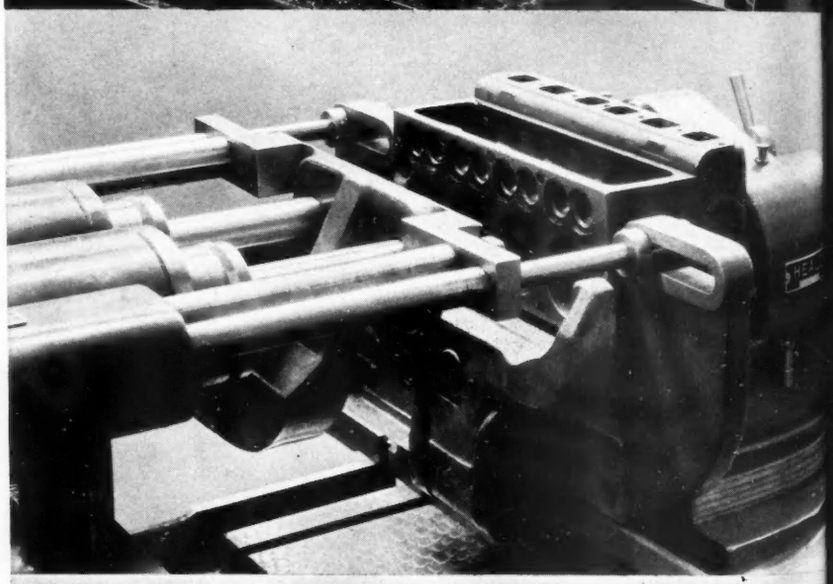
7/8 INCHES

Every type and size of cylinder can be precision finished on a Heald Bore-Matic. This ranges from the opposite tiny miniature engine cylinder (see cylinder attached to loading plate on table) with only 7/8" bore, 1" stroke, ideally handled on our No. 48 Bore-Matic, to a straight-8 automobile or large diesel engine cylinder.



2 1/4 INCHES

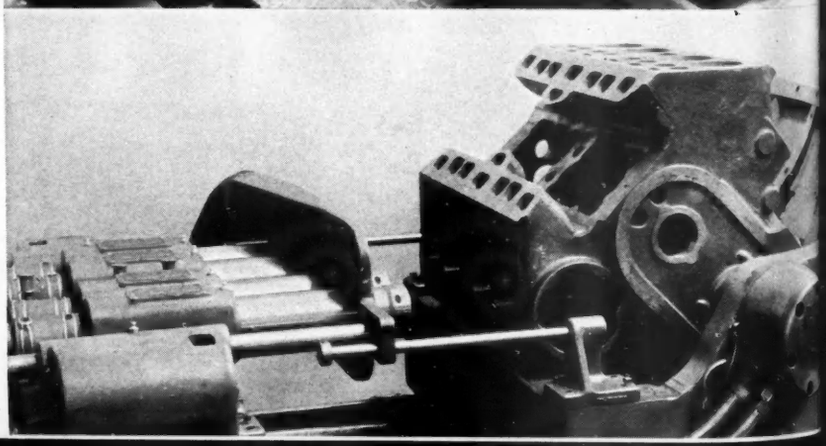
European manufacturers of small cars find the Heald No. 48 Bore-Matic ideal for precision finishing the cylinder blocks. Opposite, this machine is finishing two bores at a time with hydraulic indexing between each set of holes 2 1/4" diameter spaced 2 5/8" apart. Large size blocks, however, are better handled on larger Bore-Matics such as shown below.



3 1/2 INCHES

Here a No. 45 Bore-Matic is precision finishing a V8 automobile cylinder block. One side is precision bored, the block reversed and the other set of holes precision finished.

On a straight-8 this same machine is arranged to finish bore all 8 holes at a single pass of the tool.



THE *Heald* MACHINE COMPANY, Worcester, Mass., U. S.

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AUTOMOTIVE INDUSTRIES

Founded 1895

Vol. 76, No. 17

April 24, 1937

This Week

You have been waiting for the second part of P. M. Heldt's article on automatic transmissions. Turn to page 625 and you will find the completion of a treatise that is not only interesting in historical data but full of engineering lore as well.

The SAE held its annual meeting on Tractor and Industrial Power. There were some papers of interest presented that you will find abstracted if you turn to page 618.

The Fiat Model 500 Engine is said to be the smallest passenger car engine. This unique powerplant is shown in the mechanical drawings shown on pages 631 and 632.

Sales Near '29 Level

Peak of Retail Demand, Expected Next Month, May Push Car Sales through Previous High Marks

By Harold E. Gronseth

At a new high level since 1929, and still climbing, retail sales of motor vehicles stand a good chance of equaling their previous record rate during the next few weeks. The peak of the current season should come sometime early in May. By then, practically all plants will be operating at top speed and companies whose field stocks approached the vanishing point during recent strikes, at least to some extent will have replenished their dealers. The full force of pent-up demand and the usual seasonal bulge hit the market at about the same time with strong possibility of boosting sales volume at least temporarily to the 1929 level, if not higher.

While the next fortnight may see the peak of demand, no important recession is anticipated for many weeks. The orders already booked are sufficient to maintain heavy volume through May. Plants which recently resumed production after strikes are as much as 60 days behind on orders.

Although inadequate stocks cut down the sales volume of some companies during March, the industry last month is estimated to have delivered at retail a total of 482,000 cars and trucks, or nearly 21 per cent more than in March, 1936. This estimate, based on actual deliveries of the principal companies, shows passenger car sales at 410,000 and trucks at 72,000 units.

As is generally true when volume is rising, all sales are not reflected in registrations for the month. In March last year, registrations lagged 11 per cent behind actual sales as reported by dealers to the factories.

The combined retail volume of eight manufacturers for the first 10 days of April showed a gain of approximately 24 per cent over the first 10 days of March. These manufacturers were all in full production during both periods but despite this fact were unable to

(Turn to page 613, please)

Far-Reaching Demands on Packard

UAW Asks Sole Bargaining Rights, Plus Paid Vacations, Shop Steward System and Other Privileges for Members

Packard's first conference with representatives of the United Automobile Workers Union on April 16 lasted only seven minutes but the list of demands presented by the union was the longest received by any company in the automobile industry. The conference was adjourned until Wednesday this week to give the company time to study the 22 demands made by the union, including that of sole collective bargaining rights.

Richard T. Frankensteen, organizational director for the UAW in Detroit, claims that 10,000 of the company's 16,000 workers are union members and intimated the union might invoke the Wagner Act if necessary to gain sole bargaining rights. But M. M. Gilman, Packard's vice-president and general manager, said he would be very much surprised if the union had a majority of the company's employes on its membership rolls.

Several new features are incorporated in the union demands on Packard. In addition to the usual provisions for hours, wages, seniority and shop steward system, the union demands the right "to refuse to work on any material manufactured by non-union labor when the same material may be obtained manufactured by union labor." Another demand is for two weeks' vacation with pay, annually. The union wants all plant rules to be passed on by shop stewards as well as transfers from one department to another. It would have bulletin boards provided for the use of stewards; not more than 15 minutes penalty for failure to ring the time-clock; 48 hours advance notice of Saturday work; and permission for employes to resume their true names where assumed names have been used for legitimate reasons. Following a layoff, the union asks that an employe be notified to report to work and given seven days before losing his seniority or being taken off the company's roll. Employes are not to be responsible for time lost by break-downs or any slowing-up that is not the employe's fault.

(Turn to page 612, please)

Graham Out of Red

Packard Net Twice Last Year's; Others Report Gains

The Graham-Paige Motors Corp. and subsidiaries report for quarter ended March 31, 1937, net profit of $10,891 after depreciation, interest, Federal income taxes, etc., equivalent after allowing for quarterly dividend requirements on 4727 shares of 7 per cent cumulative preferred stock, on which there is an accumulation of unpaid dividends, to less than 1 cent a share on the common stock. This compares with net loss of $186,240 in first quarter of 1936.

Current assets as of March 31, last, including, $332,630 cash, amounted to

$2,789,987 and current liabilities were $1,724,125. This compares with cash of $608,435, current assets of $2,504,121 and current liabilities of $1,746,131 on Dec. 31, 1936. Inventories totaled $2,117,545 against $1,611,823 at close of year 1936.

Through consolidation of its operations in its main factory in Detroit Graham-Paige has reduced its manufacturing costs materially and is in position to obtain increased production. The company plans the sale of two of its unused properties which will add considerably to working capital.

Graham is now tooling up for the manufacture of a farm tractor which will be sold to Sears Roebuck & Co. and distributed by that company. At the annual meeting the board was increased to seven from four, with Edmund A. Polhaus, Arthur H. Seiler and Chester M. Stempson, all connected with the corporation, becoming directors.

Packard Earnings Double

Earnings of the Packard Motor Car Co. for the first quarter of the current year were in the neighborhood of twice those of the corresponding quarter a year ago, Alvan Macauley, president, stated at the annual meeting.

In the first quarter last year net profit was $1,248,029 or 8 cents a share on 15,000,000 no par shares of capital stock.

M. M. Gilman, general manager, stated that production of Packard cars is currently running at the rate of 15,000 a month. The company expects to produce and sell 140,000 units during the current model year, Mr. Gilman said. Mr. Gilman also pointed out that Packard sales in 1936 show a bigger percentage gain over the previous year than those of any other company in the industry. That condition is also true for the quarter ended March 31.

Mr. Macauley stated that "our wages have gone up faster than materials. We expect, however, that material costs will continue to rise and possibly catch up with the increases we have made in wages."

Chrysler Reports Gains

K. T. Keller, president of the Chrysler Corp., stated at the annual meeting, April 20, that demand for his company's products is strong while stocks of its cars and trucks "are exceedingly low.

"You may be interested to know that in our peak week this spring, the week ended March 13, retail sales were approximately 27,700 units and for about six weeks prior had been running some 10,000 cars and trucks ahead of the corresponding weeks in 1936," he said.

Pointing out that the corporation has been able to swing into production quickly since its strike was settled April 6 Mr. Keller said, "yesterday we produced 5656 cars. Starting from a shutdown condition within a week this corporation is fast reaching capacity production."

Referring to the magnitude of the corporation's operations, Mr. Keller said: "The current volume requires material purchases to the extent of about $10,000,000 a week and a payroll of about $2,000,000 a week."

Bohn Aluminum & Brass Corp. reports for the quarter ended March 31, 1937, a net profit of $992,288 including a non-recurring profit from sale of a portion of its excess copper stocks, and after charges, depreciation, federal income taxes, but before surtax on undistributed earnings, equal to $2.81 a share on 352,418 shares of capital stock. This compares with $335,129 or 95 cents a share in the like 1936 quarter.

The Twin Coach Co. Reports for the quarter ended March 31, 1937, a net profit of $166,224 including a non-recurring profit of $25,257 and after depreciation and Federal income taxes but before the surtax on undistributed profits, equal to 35 cents a share. This compares with $100,054 or 21 cents a share in the first quarter of 1936.

Firestone Still Refuses To Negotiate with URW

The Firestone-United Rubber Workers deadlock in Akron, now the largest CIO-directed strike in the United States, continues to drag on with no apparent signs of weakening on either side. The Firestone plants, closed since March 3, with 10,000 workers idle, continue to be picketed by union men who report for picket duty at the same hours as they reported for shift duty in the factory. The CIO continues to demand sole bargaining rights and recognition. The company has not modified its original statement that it cannot recognize as subject to negotiation the CIO demand for sole bargaining rights on the ground that it involves the personal rights of employes.

Temporary downtown offices are functioning smoothly. The company has linked its officers, scattered through many downtown buildings, by its own telephone system with a special switchboard operator. Many Firestone workers are appealing to charity. Business men are being solicited for funds to feed the strikers.

Detroit Front Now Peaceful

With All Factories Back at Work, Only Scattered Sniping Between Unions Livens Scene

Although three tool and die shops in Detroit are afflicted with strikes and a half dozen more are negotiating union demands, just as they are about to enter on the 1938 model work, no serious labor disturbance is expected to delay preliminary work on next year's models.

The United Automobile Workers served a list of demands on all the independent tool shops in the city and some of the managements are conducting negotiations individually with the union as well as in groups. In a joint conference in which four shops participated, agreement was reached on most points. Some differences remained on question of wages and hours. Since the situation is about the same for all job shops, it is believed that once a formula for settlement of current disputes is arrived at, it can be applied to any future controversy.

Two unions are fighting for control of the tool and die workers and a third has entered the picture. The UAW has been conducting an active organization campaign among these skilled workers since the first of the year and probably has the largest following. The Mechanics Education Society, which was first in the field, was a dominant factor until a year or two ago when it suffered a heavy slump in membership. Lately it has been gaining both pres-

International News Photo

J. B. Highfield (left), general plant manager, and Harry U. Carmichael, vice-president, of General Motors of Canada, Ltd,. discuss the strike in their company's Oshawa plant.

tige and membership and promises to be a formidable rival of the UAW for control of tool and die workers. An independent union known as the Society of Tool & Die Craftsman is a new organization with comparatively small membership.

Tool and die makers of Fisher Body plant No. 23 voted April 17 to accept tentatively an agreement reached in negotiations between the management and the UAW. Because the company's proposal fell short of their original demands, about 450 UAW members employed in the Fisher tool and die plant passed a resolution at a mass meeting to "instruct the committee that, should the prevailing wage scale rise, the wage question shall be reopened and the necessary adjustments made." The agreement provides for a five per cent general hourly increase for all employes except elevator operators and janitors and other wage adjustments.

Mathew Smith, general secretary of the MESA criticized the agreement, declaring "the MESA was painfully surprised at the frightfully low rates alleged to have been negotiated by the UAW and Fisher Body Corp. These rates,' he said, "are generally 15 cents an hour lower than those being negotiated by our society and we can only assume that this agreement was mistakenly made because of the ignorance of the negotiators as to the prevailing rates of tool and die workers in this city. We have agreed to supply the UAW at all times with skilled men's rates in the manufacturing plants in the area and we are sorry this information was not asked for prior to the signing of the Fisher agreement. This is the natural result of having production workers do the negotiating for the skilled men in the industry."

A slow-down strike was tried at the Ternstedt Mfg. Co. plant last week as a protest against the management's alleged failure to meet with a UAW committee. But the international officers of the union advised workers to resume normal speed and arranged for a conference. E. S. Skinner, general manager of the plant, denied that the management had failed to negotiate with the committee, declaring a conference had been held with union representatives just a few days before the strike.

A new union is being formed in the automobile industry, designed to appeal to the more conservative minded workers, its policies being opposed to sitdown strikes, unlawful seizure of property, sabotage and unnecessary picketing. Incorporated under Michigan laws, March 11, it claims to be the first labor union in the country to assume such legal responsibility. Locals will be chartered by craft, trade, profession or entire industry and plant foremen and executives will be admitted as honorary members.

The new union, known as the American Labor League, claims to have recruited 3000 members in Detroit during the past week and expects to double that number in a few days. Organization work has started in Michigan and Ohio and shortly will be extended to other parts of the country as the union is to be national in scope.

Announcement of its formation was made by Daniel M. Robins, a clerk in the maintenance department of the Chevrolet gray iron foundry in Saginaw, who has been elected first president. Other officers are J. E. Perryman, vice-president and director of organization, and Mark McDonald, secretary and treasurer, both of Detroit. J. F. Reuter, Detroit, is chairman of the executive council, C. M. Stewart, Detroit, vice-chairman, George Collins, Flint, secretary, and Thomas Foster, Lansing, counsel.

Initiation fees are 50 cents and while monthly dues have not been definitely determined they will probably be the same amount.

International News Photo

Premier Mitchell F. Hepburn of Ontario, took a firm stand against the CIO and assailed the methods that "had brought the U. S. almost into a state of anarchy."

Willys-Overland Signs Agreement with UAW

A formal wage and working agreement between Willys-Overland Motors, Inc., and the United Automobile Workers, Local No. 12, was signed in Toledo April 19. David R. Wilson, president, entertained the executive committee of the union and the Willys-Overland works council members at dinner following the signing of the agreement.

The contract continues the five-day, 40-hour week work schedule which has been in effect under Mr. Wilson's regime. A set rate and piece work rate has been established for every operation in the plants with a guaranteed base rate applicable to every operation. The union officials said the base rate guaranteed protects workers against loss of production due to interruptions beyond their control.

The agreement recognizes the UAW as the bargaining agency for its members in the Willys-Overland plants; establishes departmental seniority rights; guarantees base pay for piece workers; provides a 20 per cent piece work bonus on production exceeding volume on which base pay is guaranteed; guarantees two hours pay for workers called to report in event there is no work for them when they report; sets minimum pay of 55 cents an hour for female labor and 58 cents an hour for male labor; and fixes minimum salaries of $25 to $40 a week for male employes in factory offices and $16 to $25 for female office employes.

One of the unique clauses in the agreement which was offered by Mr. Wilson without any demand from the union is the "right to transfer an aged worker to an easier task of employment in the plant instead of discharging him because of physical disabilities due to ill health."

Oshawa Talks Begin

Premier Hepburn Wins Exclusion of CIO from Conference

The firm stand of Premier Mitchell Hepburn of Ontario, against the Committee for Industrial Organization brought him victory in the second week of the General Motors strike at Oshawa. A conference to determine wages, hours and working conditions began in his office in Toronto, April 22, without recognition of the CIO. The Oshawa local was represented by its attorney, J. L. Cohen, of Toronto, and its president, C. H. Millard, and it was understood that Homer Martin, UAW president, and Hugh Thompson, CIO organizer in Oshawa, would remain out of Canada during the negotiations.

General Motors has already made an offer to raise wages 7 cents an hour for those getting less than 55 cents an hour, and 5 cents an hour for those receiving more; to establish a 44-hour week; and to make other concessions as to seniority rules, speed-up complaints, etc., so that it is believed it will not take long for the conference to come to a final agreement and end the strike.

Nash-Lafayette Lines Add All-Purpose Coupe Bodies

An all-purpose coupe has been added to the Nash-Lafayette line of bodies and will be available on all three 1937 series. It has two auxiliary seats directly behind the regular coupe seat, giving seating room for five persons in the car. The spare tire is carried in the rear deck in the new models. When not in use, the extra seats fold up flush against the back of the coupe body, thus providing extra luggage space within the body.

Alfred H. Swayne Dies

GM Vice-President and Director Was Authority on Banking

Alfred Harris Swayne, vice-president and director of the General Motors Corp. and chairman of the board of directors of the General Motors Acceptance Corp., died April 16 in New York Hospital. Best known in the automotive world for his part in organizing the General Motors Acceptance Corp., he was a banker of long and varied experience and was also an authority on highway transportation in which he had been actively interested for many years. Funeral services for Mr. Swayne were held at St. Bartholomew's Church, New York, April 19, and interment was at Southampton, L. I.

Mr. Swayne was born April 5, 1870, in Washington, D. C. He was one of the five children of General Wager Swayne and Ellen Harris Swayne. His father was engaged in law practice in Washington at the time Alfred Harris was born.

When Mr. Swayne was a boy of 10, his family moved from Washington to New York City, where he spent most of his life. His preparatory school work was at St. Paul's School in Concord, N. H. He graduated from Yale in 1892.

Mr. Swayne entered the New York Law School, received his degree in 1894 and the same year was admitted to the New York Bar. He entered the law firm of Davies, Stone and Auerbach, counsel for large corporate interests. Retiring from this firm, he made a tour of the world during the years 1895 and 1896. He returned home to join the law firm of his father, Swayne and Swayne, counsel for a number of the leading railroads.

In November, 1898, Mr. Swayne went to Cuba as legal adviser of the North American Trust Co., which had a contract to act as fiscal agents of the United States government there. He devoted two years to the organization of a modern banking system in Cuba, the system which is now the National Bank of Cuba. Returning to New York, Mr. Swayne became active in banking as treasurer of the Atlantic Trust Co.

In 1901 he became associated with the firm of Moore and Schley, members of the New York Stock Exchange. After a few months he became a partner in the banking and brokerage firm of Tailer and Robinson.

When the United States declared war in 1917, Mr. Swayne retired from business and became a member of the executive committee of the National War Savings Committee of Greater New York. Throughout the duration of the war he served the government without compensation, engaging in government loan activities associated with the Federal Reserve Bank in the Second Federal Reserve District.

In January, 1919, Mr. Swayne became associated with General Motors as vice-president in charge of financial policies and operations of the General Motors Acceptance Corp. He was active in the incorporation and organization of the Acceptance Corp. and on March 24, 1921, was elected chairman of the board of directors. On Jan. 13, 1921, he was elected a director and vice-president in charge of banking relations of General Motors Corp.

Mr. Swayne's financial experience enabled him to establish a cash control system for General Motors which permitted the corporation to obtain a very real benefit from its extensive organization. Under this system, unused funds were kept at a minimum at any one point, and unproductive capital formerly tied up in transit was made available for use whenever required, thus effecting a considerable saving. On Aug. 19, 1919, Mr. Swayne was elected a vice-president of General Motors Export Co. For a number of years he was active in export operations and made numerous trips abroad in the interest of the corporation.

Mr. Swayne was considered an outstanding authority on problems of highway transportation, both in this country and abroad. For many years he devoted much time and effort toward the solution of problems of the highway user, particularly as related to safety and efficiency. Mr. Swayne was chairman of the National Highway Users group of the Joint Railroad and Highway Users Committee. In this capacity he made valuable contributions toward bettering relations and bringing about a more practical understanding between railroad interests and highway users of the country.

Alfred H. Swayne

As first vice-president of the Automobile Manufacturers Association and as chairman of the highways committee of that organization, Mr. Swayne for many years devoted his efforts to projects sponsored by the association and to state and national programs for improvement of conditions for the motoring public. Mr. Swayne was chairman of the national automobile show committee, sponsored by the Automobile Manufacturers Association and held annually at the Grand Central Palace in New York City.

Mr. Swayne was a member of the boards of directors of the following firms: Irving Trust Co.; General Exchange Insurance Corp.; American Home Fire Assurance Co.; North Star Insurance Co.; General Reinsurance Corp.; General Alliance Corp.; Stuyvesant Insurance Co.; Lehigh Valley Railroad; E. W. Bliss Co.; Globe and Rutgers Insurance Co.; Long Island Railroad; St. Louis Southwestern Railway Co. and C. Tennent and Sons Co. He was a trustee of the North River Savings Bank, and for many years had been active in the affairs of the Gould Foundation for Children, and the Travelers Aid Society.

Mr. Swayne is survived by two sisters, Miss Eleanor Swayne of New York, and Mrs. Virginia Lomas, of Brussels; and two brothers, Wager Swayne of New York, and Noah Swayne, who is a member of the Connecticut State Legislature.

SAE Summer Meeting

Program of Six-Day White Sulphur Springs Session Announced

The detailed program of the SAE Summer Meeting, to be held at the Greenbrier Hotel, White Sulphur Springs, W. Va., May 4 to 9, has been announced as follows:

Tuesday, May 4

AIRCRAFT POWERPLANTS

8:30 p.m.

Chairman, ARTHUR NUTT

Trend of Air-Cooled Aero Engines in the Next Five Years—A. H. R. FEDDEN, Bristol Aeroplane Co., Ltd. (To be presented by MR. EVANS).

Wednesday, May 5

9:30 a.m.

CAB-OVER-ENGINE TRUCKS
Chairman. J. M. ORR

Cab over-Engine Trucks—Their Place in Transportation—PIERRE SCHON, General Motors Truck Co.

Cab-over-Engine Trucks—Their Advance in Design—A. M. WOLF, Consulting Engineer.

Maintenance of Cab-over-Engine Trucks vs. Conventional Trucks—ROBERT CASS, White Motor Co.

9:30 a.m.

AIRCRAFT RADIO SHIELDING
Chairman, A. L. BEALL

Electrical Character of the Spark Discharge of Automotive Ignition Systems—M. F. PETERS, G. F. BLACKBURN and P. T. HANNEN, National Bureau of Standards.

Radio Shielding—H. E. GRAY, Radio Engineer, American Airlines.

An Investigation of Mica Spark Plugs—M. F. PETERS, H. K. KING, and J. P. BOSTON, National Bureau of Standards.

2:00 p.m.

AIRCRAFT ENGINES
Chairman, R. N. DUBOIS

The In-Line Air-Cooled Aircraft Engine—A. T. GREGORY, Ranger Engineering Corp.

Altitude and Other Variables Affecting Flame Speed in the Otto Cycle Engine—

International News Photo

Charles E. Duryea (right) looks on as his granddaughter, Joan, unveiled, in Springfield, Mass., April 14, a plaque honoring him as the builder of the first gasoline automobile in the U.S. The plaque is mounted on the building in front of which the first Duryea car had a "pulling test" April 19, 1892

F. L. BOUCHARD and C. F. TAYLOR, Massachusetts Institute of Technology.

8:30 p.m.

OIL TEMPERATURE CONTROL

Chairman, F. L. FAULKNER

Crankcase Oil Temperature Control—E. W. TEMPLIN, Los Angeles Department of Water and Power.

Thursday, May 6

9:30 a.m.

LUBRICANTS

Chairman, C. H. BAXLEY

High Oiliness—Low Wear?—G. L. NEELY, Standard Oil Co. of California.

High Pressure Viscosity as an Explanation of Apparent Oiliness—H. A. EVERETT, Pennsylvania State College.

9:30 a.m.

VEHICLE PERFORMANCE

Chairman, S. JOHNSON, JR.

Fundamentals of Vehicle Performance—M. C. HORINE, Mack Manufacturing Corp.

2:00 p.m.

Field Day

8:20 p.m.

BUSINESS SESSION

President, H. T. WOOLSON, in the Chair

8:30 p.m.

SAFETY

Chairman, P. G. HOFFMAN

Safety in Car Design—J. H. HUNT, General Motors Corp.

Friday, May 7

9:30 a.m.

GADGETS

Chairman, A. G. MARSHALL

A Springless Bouncing Pin Indicator—EARL BARTHOLOMEW and CLEVELAND WALCUTT, Ethyl Gasoline Corp.

The Sunbury Knock Indicator—RICHARD STANSFIELD, Anglo-Iranian Oil Co. (To be presented by J. R. SABINA).

Spark Advance Indicator—J. R. MACGREGOR and K. R. ELDREDGE, Standard Oil Co. of California.

A Spark Advance Indicator for Road Test Use—J. E. MACAULEY, GILBERT WAY and SIDNEY OLDBERG, Chrysler Corp.

Automatic Speed-Load Dynamometer Control—J. R. MACGREGOR and L. T. FOLSOM, Standard Oil Co. of California.

Valve Gear and Crankshaft Vibration Studies with Cathode Ray Oscillograph—MAX M. ROENSCH, MAYNARD YEASTING and SIDNEY OLDSBERG, Chrysler Corp.

9:30 a.m.

TRAILERS

Chairman, G. L. MCCAIN

What the Trailer Means to the Car Manufacturer—JAMES H. BOOTH, Buick Motor Co.

Report of Trailer Hitch Standardization—A. G. HERRESHOFF, Chairman, SAE Standards Subdivision on Tourist Trailer Couplings.

An informal exhibit of various types and makes of trailers is planned in connection with the Trailer Session.

8:30 p.m.

SOCIAL EVENING

Saturday, May 8

9:30 p.m.

HYPOID GEARS

Chairman, ERNEST WOOLER

Hypoid Gears, Axles and Lubricants—W. A. WITHAM, Gleason Works.

Need for Simplifying Recommendations of Transmission and Rear Axle Lubricants—C. M. LARSON, Sinclair Refining Co.

9:30 a.m.

DIESEL ENGINES

Chairman, A. W. POPE, JR.

Report of Vounteer Group for Compression Ignition Fuel Research—T. B. RENDEL, Shell Petroleum Corp.

Behavior of High and Low Cetane Diesel Fuels—R. A. ROSE and G. C. WILSON, University of Wisconsin. (Presented as specially prepared discussion).

Development of the Murphy Diesel Engine—M. J. MURPHY, Murphy Diesel Co., Ltd.

8:30 p.m.

BODY DESIGN

Chairman, L. L. WILLIAMS

Artistic Streamlining Against the Wind Tunnel—ALEXIS DE SAKHNOFFSKY, Engineering Stylist.

Function in Modern Styling—FREDERIC A. SELJÉ, Chrysler Corp.

Sunday, May 9

9:30 a.m.

DIESEL ENGINES

Chairman, T. B. RENDEL

Recent Trends and Developments in European Automotive Diesel Engine Design—H. R. RICARDO and J. H. PITCHFORD, RICARDO & Co. (To be presented by MR. PITCHFORD).

Diesel Streamliners—Operating and Maintenance Problems and Economies—F. J. JUMPER, Union Pacific Lines.

Driver Licenses in 8 More States

Adoption of driver license laws in eight States thus far this year, with the possibility of several more before the end of current legislative sessions, was declared to be the greatest contribution to highway safety thus far in 1937 by Alvan Macauley, president of the Automobile Manufacturers Association.

French Plants Hit by 40-Hr. Week

New Law Has Boosted Labor Costs 65 Per Cent and Caused a Shortage of Skilled Workers

By W. F. Bradley

The 40-hour week, which generally takes the form of five days of eight hours, is now general throughout the French automotive industry. At the same time as this law went into effect, annual paid holidays were instituted and increased rates of wages went into effect. These measures have increased labor charges 65 per cent, according to Robert Peugeot, president of the Peugeot Automobile Co. There has been an increase in the number of workers, although the technical staffs have remained the same, and since the law went into effect there has been a scarcity of skilled labor.

The increase in the price of cars differs, being as high as 20 per cent in some cases and as low as 5 per cent in others. Big factories have been less affected than small ones. Small concerns making high-class cars by hand methods have felt most heavily the increased labor costs. The delivery and service departments of the smaller concerns have found the law irksome, for clients are often deprived of their cars because of the inability to put in a short amount of overtime. Makers generally are behind on deliveries, but this is due more to strikes in the metal trades than to the actual reduction of working hours. Because of delays in the delivery of new cars, the used car market is strong.

Repair shops are subject to the 40-hour law, but until a few days ago gasoline stations were exempt. The 40-hour law now having been applied to all retail businesses, and workers claiming five days of eight hours, there is a possibility of all gasoline filling stations having to close either on Saturday and Sunday or Sunday and Monday. The automobile associations are protesting against this eventuality, which would have the effect of tying up automobile traffic two days a week. A possible outcome is that where only one or two men are employed these will be dismissed and the owner will operate alone, or with members of his family. The law clearly indicates that businesses can be kept open, providing labor is not employed. This also gives advantage to small repair shops operated by two or three members of the same family.

THOMAS H. CORPE, director of advertising and sales promotion of Buick, was named president and **EARL C. McGINNINS,** advertising manager of the AC Spark Plug Co., vice-president, of the newly organized Advertising and Sales Club of Flint, Mich.

CHARLES A. COOPER, formerly chief accountant of the Timken Silent Automatic division of the Timken-Detroit Axle Co., has recently been appointed assistant secretary and assistant treasurer in charge of credits of the Timken-Detroit Axle Co., to succeed L. R. Baldock, deceased.

ALEX M. MILLER, Chrysler Corp. of Canada, Ltd., and **B. A. BROWN,** Studebaker Corp. of Canada, Ltd., are members of the board of directors of the recently formed Advertising and Sales Club of Windsor, Ont.

E. J. UMPHREY, formerly manager of the Montreal zone, has been appointed assistant general sales manager of General Motors Products of Canada, Ltd.

MAJ. R. W. (SHORTY) SCHROEDER, first assistant director of the Bureau of Air Commerce, will resign soon to take an executive position in the operations department of United Air Lines, with headquarters at Chicago.

SIDNEY SMITH, formerly with the Studebaker Corp. and later with the Bantam Roller Bearing Co., has joined the production staff of the Young Radiator Co., at Racine, Wis.

Demands on Packard

(Continued from page 607)

Minimum rates of pay demanded are 75 cents an hour for women and 85 cents for men. A blanket increase in wages of 10 cents an hour is asked and additional pay of 10 cents an hour for all night workers.

Employing the same strategy used in the Chrysler dispute, union leaders presented the Packard management with resignations of 20 of the 25 members of the plant board which had been established under the proportional representation rules of the 1934 Wolman Automobile Board. It corresponds to the works council which existed in Chrysler plants.

Satisfactory progress was being made in negotiations between Packard and the UAW, according to union officials who intimated that an agreement might be reached in a few days.

Ford's Tire Plant to Have Daily Capacity of 18,000

Delivery of specially designed tire and tube building machinery to the Ford Motor Co. of Detroit under a million dollar rush order recently placed with the National Rubber Machinery Co., of Akron, will be started June 15 and will be completed within 100 days, officials of the company state. The order covers 300 dual type tire vulcanizers and 74 new type tube vulcanizers. The 300 tire vulcanizers will be capable of producing a minimum of 18,000 tires per day, on a 24-hour basis, it is stated.

Ford orders for several million dollars' worth of heavy tire and tube building machinery—mixers, masticators, rubber mills, calenders, etc., were placed many months ago. Some of these deliveries cannot be made inside of 18 months from date of order, it is believed. Firestone tire engineers are reported to have been in Detroit for the past several weeks, working closely with Ford engineers on plant arrangement, equipment installation and tire design. It is understood the new Ford tire will be unique in construction features and in tread design. It will be known as the "Ford" tire. Ford officials indicate that the Detroit plant will be used to supply about half of the company's original equipment tire requirements, the balance to come from Firestone. Firestone has been supplying more than half of all Ford tires, Goodyear and United States Rubber Co., of Detroit, dividing the balance. Under the new program it would appear that Goodyear and U. S. may lose their share of this business.

:SLANTS:

SPY SCARE—*Recovery by the police and the Yokohama gendarmerie of a set of "secret" plans for a military passenger automobile, allegedly stolen from the room of a Japanese army captain by the nephew of a Japanese employed in a foreign embassy in Tokyo, disclosed the existence of the Tsurumi Automobile Co., of Yokohama, to which the captain was attached. Newest of Japan's automobile companies, Tsurumi evidently intends to specialize in military vehicles.*

MODERN TIMES—*Salesmen of the Bender Body Co. are to cover their territories in luxurious apartments on wheels in the future. Each has been given a Bender Travel Mansion which will be attached to his car and be his home. Some of the married salesmen say they intend taking their wives with them so that rent bills will be a thing of the past. "You'll know your product better by living in it," said E. J. Speh, sales manager. "You can show your prospects what a cozy home a trailer is."*

Hupp Reorganization Plan Approved by Stockholders

Stockholders of the Hupp Motor Car Corp. approved April 17 by a vote of more than two-thirds of the outstanding stock the recapitalization plans submitted by the board of directors which will provide $2,600,000 in new capital.

The recapitalization plan provides for a change of the present $10 par value common stock to $1 par value with each share of the present stock outstanding equal to one-half share of the new stock. The total authorized capital stock will remain at 2,000,000 shares.

Early resumption of manufacturing operations is planned, according to Mr. Bradley, who stated that new financing plans provide for more than ample capital to insure Hupp a strong position in the industry. The company is now engaged in tooling operations for the new 1938 models of sixes and eights which will constitute the 30th series of Hupmobiles since the company was started in 1908. The company has been notified by the Securities and Exchange Commission that the registration statement for its new finance program had become effective April 19. The new stock has been listed on the New York and Chicago stock exchanges and rights shortly will be issued to present stockholders.

Value of Oil Filters

SAE Meeting in Baltimore Hears Paper on Benefits of Oil Cleaners

The first "vocational group meeting," sponsored by the Transportation & Maintenance Activity of the Society of Automotive Engineers, was held recently in Baltimore, with 250 persons in attendance from 18 states, the District of Columbia and Canada. The topic of the opening session was "oil filters." The many angles of this subject were covered in a paper by James I. Clower, associate professor of machine design, Virginia Polytechnic Institute. He reached this general conclusion:

"It cannot be said that an oil filter is essential to the operation of a motor vehicle. However, the use of one of the more efficient types will, in my opinion, greatly extend the interval between oil changes, and the saving in oil thereby made will in general more than cover the cost of the filter. Furthermore, the use of a filter will generally reduce piston, ring and bore wear, and valve and ring sticking, and in this way reduce oil consumption and possibly fuel consumption. Some of the present filters are capable of maintaining the acidity of the oil at a low value, thereby minimizing corrosive effects, especially on the newer copper-lead and cadmium-silver bearing alloys."

Speaking of crankcase oil impurities, Professor Clower said there does not appear to be sufficient test data to support the conclusion that dilution permits wear. On the contrary, recent tests indicate that no appreciable increase in wear is discernible even with extremely highly diluted oils. The impurities more likely to cause trouble consist mainly of metal particles worn from the engine, core sand, drillings, metal chips loosened by hot oil, vibration and metal expansion, and in some cases iron oxides resulting from the corrosion of various interior surfaces. These impurities will gradually accumulate and by promoting oil oxidation and sludge formation reach a point where the oil

becomes unfit for use unless means are provided for their removal.

Having thus described the need for filters Professor Clower went on to discuss filters themselves. "Whereas filters were originally designed to filter out sludge after it had formed," he said, "today the idea is to remove the sludge-forming elements before they have had an opportunity to combine. The present trend appears to be toward the use of the by-pass, removable element type which combines both the principles of filtration and absorption."

He went on to say that a good filter should possess a maximum number of the following desirable features:

"1. It should remove all harmful impurities, including asphaltenes and so-called colloidal carbon.

"2. It should be convenient to service without disturbing the oiling system.

"3. It should be capable of maintaining its efficiency for 5000 miles.

"4. Its first cost and maintenance cost should be such that its use is economically justifiable.

"5. The filtering element should not pack or channel.

"6. It should maintain an acceptable oil color for a reasonable period of operation.

"7. The volume of oil passing through should be so controlled as not to wash back into the oil stream impurities collected.

"8. The construction should be such that the dirty oil cannot short-circuit.

"9. The 'sump' should be of ample size to collect the heavier solid impurities and water.

"10. It should present no oil loss hazard.

"11. It should be easily adapted to all makes of engines.

"12. It should be sturdy enough to withstand rough service."

T. C. Smith, of the American Telephone & Telegraph Co., presented a paper on utility trucks, cabs, bodies and auxiliary equipment. The discussion dwelt largely on the need for standardized bodies and the effect of high traction type tires on steering and maintenance. Several operators admitted steering is affected and that there is added cost in replacing front bushings but they found these tires necessary in snow to prevent side slippage.

Standardization of bodies was held desirable but difficult of attainment at the moment because of changes in operating practices and unstandardized CA and width of frame dimensions.

Sales Near '29 Level

(Continued from page 607)

handle all the available business. Their increase, therefore, does not serve as a measure of the month's sales potential. A year ago, the industry's retail sales jumped 28 per cent from March to April and the 10-year average month-to-month gain is 27 per cent.

Finally free of strikes, except for General Motors of Canada, the industry is pushing production into new high ground since 1929. Hudson has recovered its pre-strike production rate and Chrysler divisions early this week were up to 92 per cent of their previous top rate with the prospect of being back in full stride in a few days.

Domestic retail sales of Buick cars during the first 10 days of April totaled 7499 units compared with 5418 in the first 10 days of March and 5568 in the corresponding period of April a year ago. This was a gain of 2081 cars or 38.4 per cent over the previous month and 1931 cars or 34.6 per cent over the corresponding 1936 period.

Passenger Car and Truck Production—(U. S. and Canada)

Passenger Cars—U. S. and Canada:	March, 1937	Feb., 1937	March, 1936	Three Months, 1937	Three Months, 1936
Domestic Market—U. S.	376,245	276,317	323,238	938,454	808,887
Foreign Market—U. S.	27,528	20,266	20,285	71,496	57,726
Canada	19,313	14,415	14,488	48,737	36,602
Total	423,086	310,998	358,011	1,058,687	903,215
Trucks—U. S. and Canada:					
Domestic Market—U. S.	75,828	53,614	65,496	183,459	171,333
Foreign Market—U. S.	14,413	13,636	11,952	44,281	34,635
Canada	5,388	5,292	3,533	15,254	7,989
Total	95,629	72,542	80,981	242,994	213,957
Total—Domestic Market—U. S.	452,073	329,931	388,734	1,121,913	980,220
Total—Foreign Market—U. S.	41,941	33,902	32,237	115,777	92,361
Total—Canada	24,701	19,707	18,021	63,991	44,591
Total—Cars and Trucks—U. S. and Canada	518,715	383,540	438,992	1,301,681	1,117,172

300 at Tractor Meeting

SAE Members Visit Caterpillar Plants at Peoria

The Tractor Meeting of the Society of Automotive Engineers attracted 300 members to the three-day session held April 21 to 23 at Peoria, Ill. Six technical papers were presented under sponsorship of three activities of the Society: Fuels and Lubricants, Diesel Engine, and Tractor and Industrial Power Equipment.

Two afternoons were devoted to inspection of the foundry, tractor and road machinery plants of the Caterpillar Tractor Co. Visitors were also taken to the Caterpillar test farm to witness machine demonstrations and tests.

The following papers were presented: "Crankcase Ventilation and Sludge", E. E. Lowther; "Effect of Addition Agents in Lubricating Oil on Piston and Ring Performance", C. M. Larson; "Fuel Injection Equipment", H. C. Edwards; "Resistance Electric Welding", E. A. Mallett; "Some Factors Affecting the Design and Performance of Diesel Fuel Injection Equipment", G. C. Riegel, E. W. Jackson and J. M. Davies; "Servicing of Multi-Cylinder Diesel Engines", R. J. Kretz. Abstracts of some of the papers will be published in a subsequent issue of *Automotive Industries*.

Briggs-UAW Negotiations Finally End in Agreement

After more than a month of negotiations, the Briggs Manufacturing Co. signed an agreement with the United Automobile Workers April 17 and the following day nearly 5000 union employes of Briggs ratified the pact at a mass meeting in Detroit.

The agreement, which runs for a year, contains an anti-strike clause which binds the union "not to cause or permit its members to cause" any strike or interference with production at any of the company's plants. It recognizes the UAW as collective bargaining agency for such employes as are members of the union.

Wage and hours provisions call for minimum hourly rates of 65 cents for women and 75 cents for men. Hiring rate is 10 cents less for each classification with a five cents an hour increase after four weeks and another five cents after 12 months.

Books

of automotive interest

S.A.E. Handbook, 1937 Edition. Society of Automotive Engineers, 29 West Thirty-ninth Street, New York City.

The 1937 edition of the S.A.E. Handbook has made its appearance. It retains its familiar form, the principal contents being all of the S.A.E. Standards and Recommended Practices. The new material includes the new specifications adopted by the Standards Committee in 1936 together with revisions in older specifications. The new specifications cover motor vehicle clearance, marker and identification lamps, aircraft fuel pump mountings, motor-vehicle headlamp mountings, motor-vehicle headlighting inspection code, motor-vehicle emergency electric lanterns, motor-vehicle license plates, flange-type magneto mounting for tractors, tractor testing code, and valve-seat inserts. Seven standards and recommended practices were canceled in 1936, 27 were revised and three were corrected.

In addition to the standards and recommended practices the handbook contains a list of the officers of the society and the personnel of the Standards Committee, general information on dimensional tolerances, inch-millimeter conversion tables, and the regulations of the Standards Committee.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES

Another drop in general business activity was registered last week. One weekly business index stood at 99.2, falling below the 100 mark for the first time since Feb. 13, as against 101 for the preceding week and 87.2 a year ago. The current decline is largely the result of a reduction in bituminous coal production, which was due for the most part to the closing of mines in several districts pending wage negotiations. Retail sales were estimated from 8 to 15 per cent above the volume a year ago. It is believed in some quarters that retail purchasing has not yet reached its peak. Annual meetings of many large corporations have recently disclosed that earnings during the first quarter of this year are better than in any quarter since the beginning of the depression.

Railroad Income Higher

According to the Association of American Railroads, aggregate gross revenues of 94 Class 1 railroads during March were 22 per cent larger than those in the corresponding period last year. Railway freight loadings during the week ended April 10 amounted to 716,044 cars, which marks a decline of 10,643 cars below those in the preceding week, a gain of 94,201 cars above those a year ago, and an increase of 129,476 cars above those two years ago.

Electric Index Gain

Production of electricity by the electric light and power industry in the United States during the week ended April 10 was 13.6 per cent above that in the corresponding period last year.

Lumber Orders Rising

Production of lumber during the week ended April 3 was 68 per cent of the 1929 weekly average. New orders continued their upward trend and were the largest reported for any week since last December. There was a moderate increase in the volume of shipments.

Fisher's Index

Fisher's index of wholesale commodity prices for the week ended April 17 stood at 94.3, as compared with 94.5 the week before and 94.7 two weeks before.

Federal Reserve Statement

The consolidated statement of the Federal Reserve banks for the week ended April 14 showed increases of $3,000,000 in holdings of discounted bills, $1,000,000 in bills bought in the open market, and $28,000,000 in Government securities. Money in circulation declined $4,000,000, and the monetary gold stock rose $105,000,000.

Salesmanship Needed

Willis Tells Toronto SAE How Sales Viewpoint Helps Engineers

In the process of creating and supplying wants there are three important steps; engineering, production and selling, said F. B. Willis, vice-president in charge of sales of the Bendix Products Corp., in an address before the Canadian Section of the Society of Automotive Engineers at Toronto April 16. Asking which of these three steps in the most important is like asking which leg of a three-legged stool is most important, he stated.

"The engineer is necessarily visionary, but so often he fails to give the manufacturing and sales departments a break," Mr. Willis continued. He explained that "public mentality is almost childlike" and products must be simple to be grasped and appreciated. "It is increasingly important for the engineer to develop simpler devices to accomplish given purposes—devices which will be cheaper to manufacture and easier to maintain." Advantages of simplicity in manufacture are obvious—and so far as maintenance is concerned, please bear in mind that the average mechanic who services the products you put out has only limited knowledge."

"Do you realize how important it is for the engineer to keep an open mind?" Mr. Willis asked. "If you want to know whether your brain child is going to be accepted, just take a trip with a salesman and hear what the customer has to say about it! You may not agree with what he says, but after all the consumer is the one to be considered."

More salesmanship is needed in engineering these days, Mr. Willis believes, and he gave numerous examples of where salesmanship rather than engineering ability had aided engineers in their careers. "There are greater opportunities today than ever before for individual progress," he continued. "These opportunities are present in every field of endeavor, particularly in engineering and salesmanship, PROVIDED you are tolerant of all new ideas and examine them unprejudiced by past traditions or present opinions.

"May we in conclusion," said Mr. Willis, "offer a definition of an engineer and a salesman as two individuals whose aims and objects are in common, who realize and acknowledge how small a part of the world's knowledge they have mastered; and who approach life's problems with a receptive mind."

Adverse Tariff Ruling Hits Mexican Assembly Plants

Automobile assembling companies in Mexico must refund to the ministry of finance upward of 500,000 pesos (approximately $140,000) as a result of the adverse decision of the national supreme court in what might be styled a test case, the action having been brought by the Ford Motor Co. of Mexico for an injunction against the ministry enforcing its ruling that automobile and truck bodies pay duty on the basis of completed vehicles instead of on that of parts.

On a parts basis, the bodies paid a duty of but six centavos (about 1.5 cents) per kilogram (2.2046 lbs.). On a completed car basis, the duty amounts to one peso (28 cents) the kilogram. The company contended that the completed car valuation is unfair, because the vehicles are merely bodies when they are imported and all the assembling is done in Mexico. The court held that the ministry is within its rights in assessing on the completed car basis and ruled that the importing and assembling companies must refund to the government the difference between the parts duty rate and that of the complete cars.

Nash Advertising Account to Geyer, Cornell & Newell

The appointment of Geyer, Cornell and Newell, Inc., to handle its advertising effective with the 1938 model year has been announced today by the Nash Motors division of the Nash-Kelvinator Corp. in a letter from C. H. Bliss, vice-president, to all Nash distributors and dealers. The J. Walter Thompson Co., its present agency, will continue to handle all advertising and promotion in connection with the 1937 line of cars, the letter states. Geyer, Cornell and Newell has handled the Kelvinator Corp. advertising for the last two years.

189 New Cadillac Dealers

Cadillac-LaSalle dealer ranks reached an all-time peak in March, Nicholas Dreystadt, general manager, has announced. A total of 189 new dealers have been signed since introduction of the current models.

40 Years Ago

with the ancestors of AUTOMOTIVE INDUSTRIES

The Columbia Motor Carriage

Thursday, May 13, the Pope Manufacturing Co., Hartford, Conn., are to make their opening bow to the world as manufacturers of motor carriages.

The Pope company began its work in the motor carriage field in January, 1895, and since that date investigations and experiments have been going on to determine what is the best type of carriage. It was decided to adopt the storage battery and an arrangement was entered into with the Electric Storage Battery Co., of Philadelphia, whereby the Pope company is able to use the chloride accumulators.

The carriage is susceptible of being charged from any direct current of 110 to 120 volts. When the batteries are fully charged the current is automatically cut out. In large cities the current is obtainable at a rate which amounts to about 1¼ cents per mile of smooth, level road.

The radius of action is over 30 mi.—probably 35 mi. It has a maximum speed of 15 m.p.h. and other speeds on smooth, level roads are provided as follows: First speed, 3 m.p.h.; second speed, 6 m.p.h.; third speed 12 m.p.h.

—From *The Horseless Age*, April, 1897.

Automotive Metal Markets

Easing of Steel Demand Brings Assurance of Price Stability During Third Quarter

By William Crawford Hirsch

Tapering off in the volume of fresh buying resulted in a marked change of sentiment in the steel market this week. Two weeks ago higher prices for the third quarter were considered a possibility by some and a probability by others. Now continuance of the prevailing price set-up has become a certainty, the leading producer having reaffirmed present prices for third quarter shipments.

Backlogs suffice to keep a good many mills operating at virtually capacity, but the flow of incoming orders for a number of finished steel descriptions, incessant as it was around the turn of the last quarter, has turned into a relatively slow trickle. Releases against old commitments by automobile manufacturers and parts makers act as a steadying influence and steel producers are hopeful that during the last half of 1937 automotive consumption will make up for the loss in tonnage that resulted from strikes.

Some sheet mills are in the exceptional position of not wanting any additional business at this time, their current quarter output having been sold, but on the whole producers are more eager for business and in better shape to promise deliveries than they were at the beginning of the month.

Lessened pressure and a more rational outlook in European markets have not been without their effect on the scrap market here and mills are obtaining their requirements at somewhat lower prices than heretofore. There is less tension with reference to the supply of other steel-making materials, the movement of iron ore to furnaces having got under way much earlier than usual. From non-integrated finishing mills come complaints that, bright as the steel industry's picture as a whole may be, the spread between what they have to pay for semi-finished steel and what they realize for their products is very unsatisfactory.

Pig Iron—Sales of round tonnages to automotive foundries were reported in Middle Western markets. Shipments of iron due melters on first quarter contracts have been completed, and buying is now for nearby needs. Prices rule firm at $24 per ton for No. 2 foundry as well as malleable at basing points.

Aluminum—While the market for primary aluminum remains steady and unchanged, the undertone of that for remelted aluminum is easier, due to the better supply of scrap and the copper market's trend.

Copper—Successive breaks in copper prices on the London Metal Exchange and other foreign markets sent the red metal's price into sharply lower ground here. Following a decline of one cent a pound late last week, the price gave way further last Tuesday, when electrolytic was offered at 14½ cents, Connecticut Valley basis. Prices of automotive brasses and copper products were marked down.

Tin—With the prop of armament demand considerably weakened, speculators in London took their losses and the market moved into lower ground. Spot Straits on Tuesday was quoted at 56½ cents, compared with 60⅛ cents a week ago and 64⅛ cents a month ago.

Lead—Moderately active and easy.

Zinc—Fairly steady.

March Car Sales 18% Higher Than Last Year, Polk Reports

Registrations of new passenger cars in 24 states for the month of March disclose 118,051 sales, according to the latest R. L. Polk & Co. report. This figure indicates that the total for the month will exceed the former Polk estimate of 343,000.

The total for 24 states is 18.23 per cent higher than for the same number of states in March a year ago when 99,847 sales were recorded and is 60.08 per cent higher than February of this year when 24 states reported 73,743.

Truck and commercial car sales for 24 states in March also indicate that the Polk estimate of 52,000 will be exceeded. To date, truck registrations total 23,639. This is 44.1 per cent higher than February when 24 states reported 16,402 sales and is 7.58 per cent higher than March, 1936, when the same number of states reported 21,974 registrations.

Automotive Officials Will Address Medical Conference

At the Midwest Conference on Occupational Diseases, to be held in Detroit May 3 to 7, a number of subjects of interest to automotive manufacturers will be dealt with and papers read by officials of automotive companies.

Dr. Clarence D. Shelby, medical consultant of the General Motors Corp., will be chairman of the session on "Industry and Industrial Disease" on the morning of May 3. Dr. Gordon C. Harrold, of the industrial hygiene laboratories of the Chrysler Corp., is co-author of a paper to be read May 4 on the subject of "Industrial Hygiene Laboratories and their Work." "Eliminating Industrial Exposures by the Engineer," is the subject to be dealt with the same day by G. A. Coburn, personnel director, Delco-Remy division, General Motors Corp., Anderson, Ind.

Charles F. Kettering, General Motors vice-president in charge of research, will give an address at the banquet on the evening of May 6. The following day visitors will be the guests of the Chrysler Corp. at lunch when Dr. John J. Prendergast, medical director of Chrysler, will act as chairman and K. T. Keller, president of the corporation, will speak on "The Value of Medicine to Industry."

Letters to Automotive Industries

Economical Car Design

For several years I have studied the various possible ways of construc'ing a small car of the type suggested by Mr. Whiteside in the April 3 issue of Automotive Industries.

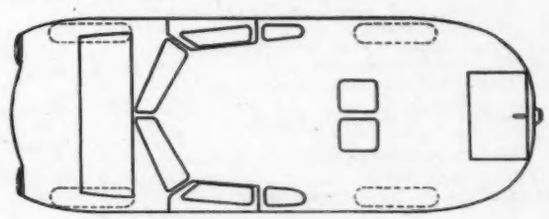
The most promising design thus far worked out has three wheels, the two front wheels steering and single rear wheel driving. The body and main support of the car is of aircraft design and uses skin stressing. An air-cooled engine between the seat and rear wheel places the driver farther forward, which aids visibility.

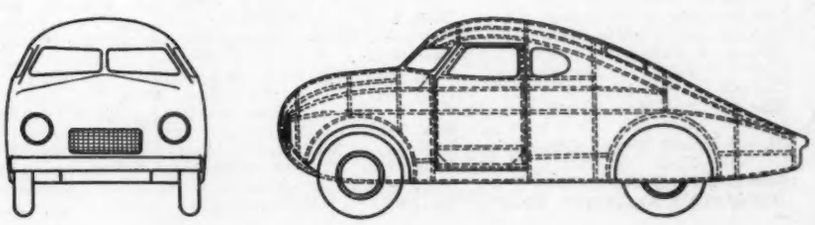
Another advantage of the design is its low weight. At present it is estimated that the total weight would be about 400 lb. This would contribute to the economy of operation, as well as to lower first cost.

I enclose a tracing and prints of a test body I am now building to further prove my theory. This one is for a Ford Model A. The material used is body steel with bulkheads and stringers of 0.032 and 0.025 respectively. The skin is of .019. All parts were formed by hand.

Dene Bethoon,
Experimental Department, Lockheed Aircraft Corp.

The drawing is reproduced herewith, but the photos are not sufficiently sharp for reproduction purposes.—Editor.





Dene Bethoon's design for a small, economical car

Wimille Makes New Record With Bugatti at Montlhéry

Averaging 91.125 m.p.h. for 120 mi. on Montlhéry circuit—the highest speed ever attained on this track—Jean Pierre Wimille won the $20,000 national prize for Bugatti, with a straight eight supercharged Bugatti of 201 cu. in. piston displacement. This was the first of the prizes offered by the national committee for the encouragement of automobile racing, and consisted of $15,000 cash and $5,000 worth of aluminum and duraluminum offered by an aluminum syndicate.

The conditions laid down by the committee were that the car should comply with the 1938 international rule, plus 10 per cent allowance on piston displacement, and that it should average 91 m.p.h. for 16 laps of the Montlhéry road circuit. This speed never had been attained, the highest being 89.2 m.p.h. for one lap set up by Chiron on an Alfa Romeo three years ago.

Wimille smashed up three cars in his attempt to win the prize and was allowed an extra 18 days in which to make the attempt. His initial laps were made at 92.4 m.p.h. and when he had a little margin in hand he eased off and finished with a margin of 4 9/10 sec. on the theoretical time. The car was similar to the one with which Wimille won second place in the Vanderbilt Cup race last year but with a reduced piston displacement.

The next prize, of $50,000, is for a similar performance on the same track not later than Aug. 31, the piston displacement being limited to 183 cu. in. The competitors will be Bugatti, Delage, Emile Petit, and probably Delahaye and Talbot. With the exception of the Petit twin eight, the cars have yet to be built.

A new line of **miniature instruments for all types of industrial and radio applications** is described in a catalog section recently issued by the Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.*

Two pamphlets describing the application of the Thornton four rear wheel drive to Ford and Chevrolet trucks, respectively, have been issued by the Thornton Tandem Co., Detroit.*

The Pratt & Whitney Division of Niles-Bement-Pond Co., Hartford, Conn., has brought out a new circular covering its John-Sons **roll thread snap gages** and other related products.*

Brown & Sharpe Mfg. Co., Providence, R. I., has published a list of Brown & Sharpe **apprentice graduates.***

The Waverly Oil Works Co. has announced publication of the ninth edition of its Waverly Handbook containing over 900 pages of technical, engineering and chemical data pertaining to the **petroleum industry.** Price of regular edition, $1.50 per copy.

The Engineering Experiment Station of Ohio State University has announced release of a new handbook on the construction of **nomographic charts.** "Alignment Charts, Their Construction and Use" was written by Dr. Paul N. Lehoczky of the university's department of industrial engineering. Price, 40 cents per copy.

A catalog covering its complete line of **automotive hand tools** has been issued by the Bonney Forge and Tool Works, Allentown, Pa.*

The Rotor Air Tool Co., Cleveland, Ohio, has brought out two new catalogs, one on Rotor **portable air tools,** the other on Rotor **portable high cycle electric tools.***

A new folder explaining the principle of the **Dardelet thread** has been published by the Dardelet Threadlock Corp., New York.*

A booklet entitled "The Path to Sheet Metal Permanence" has been issued by the Republic Steel Corp., Cleveland, Ohio. It contains, in addition to photographs showing applications of **sheet metal,** information on rust resistance, forming and welding properties, data on physical properties and constants, forms, finishes, sizes and gages.*

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* Obtainable from editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.

Calendar of Coming Events

SHOWS

Illinois Automotive Ass'n, 4th Annual Show and Maintenance Exhibit, Navy Pier, Chicago.....Apr. 24-28
Poland, Automobile Salon—16th International Fair, Poznan.....May 1-10
Norway, Automobile Salon—Oslo..May 7-10
Second Annual Automobile Maintenance Show, San Francisco.....May 20-23
Morocco, Automobile Section, Tangier Fair, Tangier .....June
France, Automobile Section, Bordeaux Fair, Bordeaux .....June 13-28
Belgium, First International Aeronautical Salon, Brussels.....June 18-30
Fourth ASTM Exhibit of Testing Apparatus and Related Equipment, New York .....June 28-July 2
Poland, Automobile Salon (Foire Orientale), Lwow .....Sept. 1-15
France, 31st International Automobile Salon, Paris .....Oct. 7-17
Great Britain, 31st International Automobile Exposition, London....Oct. 14-23
Czechoslovakian Automobile Show, Prague .....Oct. 16-24
National Automobile Show, New York, Oct. 27-Nov. 3
Italy, 10th International Automobile Salon, Milan .....Oct. 28-Nov. 8
Buffalo, N. Y., Automobile Show, Oct. 30-Nov. 6
Cincinnati Automobile Show.Oct. 31-Nov. 6
Great Britain, 13th International Commercial Automobile Exposition (trucks and buses), London...Nov. 4-13
Chicago Automobile Show.....Nov. 6-13
Akron Automobile Show.....Nov. 6-12
Omaha Automobile Show.....Nov. 6-11
Brooklyn Automobile Show.....Nov. 6-13
Columbus Automobile Show.....Nov. 6-13
Detroit Automobile Show.....Nov. 6-13
Kansas City, Mo., Automobile Show, Nov. 6-13
Motor Truck Show, 4th Annual, Newark, N. J.....Nov. 6-12
Newark, N. J., Automobile Show..Nov. 6-13
Philadelphia Automobile Show....Nov. 6-13

Show Business

Manager of the National Automobile Show in New York is Alfred Reeves, 366 Madison Ave., N. Y. C. Inquiries concerning all matters connected with the national show should be addressed to him. AUTOMOTIVE INDUSTRIES will be pleased to furnish names and addresses of local show managers on request.

Pittsburgh, Pa., Automobile Show.Nov. 6-13
Toronto, Ont., Automobile Show..Nov. 6-13
Great Britain, 36th Scottish International Automobile Exposition, Glasgow .....Nov. 12-20
Baltimore, Md., Automobile Show, Nov. 13-20
Cleveland, Ohio, Automobile Show, Nov. 13-20
Jersey City, N. J., Automobile Show, Nov. 13-20
Milwaukee, Wis., Automobile Show, Nov. 13-20
Springfield, Mass., Automobile Show, Nov. 14-20
St. Louis, Mo., Automobile Show.Nov. 14-21

CONTESTS

Indianapolis Speedway, 500-Mile International Sweepstakes .....May 31
31st Annual Grand Prix of the Automobile Club of France, Linas-Montlhéry .....July 4
Pan American Cup Race, Roosevelt Raceway .....July 5
National and International Soap Box Derby Finals, Akron, Ohio.....Aug. 15
Roosevelt Raceway, 400-Mile George Vanderbilt Cup Sweepstakes....Sept. 6
National Outboard Championship Regattas, Richmond, Va.....Sept. 18-19
Los Angeles, 500-Mile International Sweepstakes .....Nov. 28

CONVENTIONS AND MEETINGS

U. S. Chamber of Commerce, 25th Annual Meeting, Washington, D. C., April 27-29
National Machine Tool Builders' Association, Spring Convention, Edgewater Beach Hotel, Chicago....May 3-4
41st Annual Convention and Exposition of the American Foundrymen's Association, Milwaukee .....May 3-7
S.A.E. Summer Meeting, White Sulphur Springs, W. Va.....May 4-9
National Battery Manufacturers Asso., Spring Convention, Shoreham Hotel, Washington, D. C.....May 13-14
American Society of Mechanical Engineers, spring convention, Detroit, May 17-21
National Association of Purchasing Agents, 22nd Annual Convention, William Penn Hotel, Pittsburgh, Pa. .....May 24-27
American Petroleum Institute, Mid-Year Meeting, Colorado Springs, Colo. .....June 1-3
Second World Petroleum Congress, Paris France.....late May—early June
Automotive Engine Rebuilders Association, 15th Annual Convention, Chicago .....June 21-24
American Society for Testing Materials, 40th Annual Meeting, New York, June 28-July 2
American Transit Association, 56th Annual Convention, White Sulphur Springs, W. Va.....Sept. 19-23
S.A.E. National Aircraft Production Meeting, Los Angeles, Calif.....Oct. 7-9
S.A.E. Annual Dinner, Commodore Hotel, New York.....Oct. 28
American Petroleum Institute, 18th Annual Meeting, Stevens Hotel, Chicago .....Nov. 9-12
S.A.E. National Production Meeting, Flint, Mich. .....Dec. 8-10

Theory of Piston Ring Lubrication Presented

A THEORY of the lubrication of piston rings (compression rings) has been evolved by A. R. Castleman, Jr., of East Falls Church, Va., and has been discussed by him in an article in *Physics*. In developing his theory the author originally assumed that the outer surface of the ring becomes curved (in the axial direction) in use, that it is higher in the middle than at the edges, and that the slope toward each end is very gentle. Later the profiles of the faces of six worn piston rings were carefully measured by the Gage Section of the National Bureau of Standards. Each ring was measured at three points separated by 90 deg.—opposite the gap and at two points 90 deg. from the gap. Of the 18 sections thus measured all showed wear in general accordance with the original assumption. There was found to be a high point intermediate between the sides, which, however, was not at the middle of the section but closer to the lower side, averaging 72 per cent below the top of the ring. From this high point the face of the piston sloped uniformly toward each side, so that each of the two parts of the outer boundary of the ring section formed a straight line.

On the basis of these data Mr. Castleman made a recalculation of the pressure distribution over the face of the ring, making the assumptions that the ring can disappear completely in its groove, so it does not have to support any of the piston side thrust, and that there is a sufficient supply of lubricant, so that the gap between the face of the ring and the cylinder bore is always filled with oil.

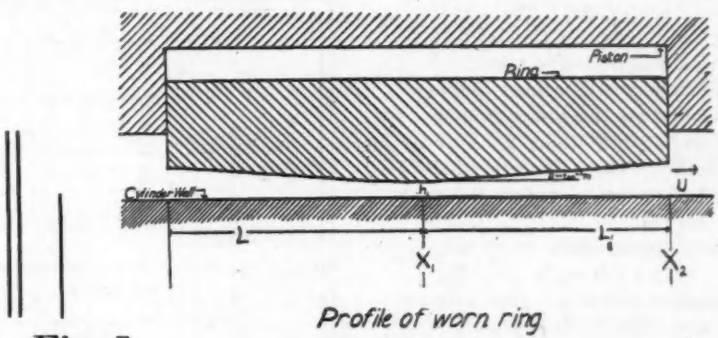
In the upper part of Fig. 1 is shown a section of a worn piston ring in its groove, while in the lower part is shown a curve of the pressure distribution over the width of the ring, under average operating conditions. The point of closest approach between ring and cylinder wall is assumed to be at the middle of the face width. In calculating the pressures, the slope of each section of the face was taken to be 5:1000, an inclination of 15 minutes (one-half of the angle of intersection between elements of the two sections of the ring face as found by the National Bureau of Standards).

The effect of motion of the ring over the cylinder bore on the pressure distribution in the film of lubricant is evidently similar to that in a thrust bearing of the Michell type; the length of the "bearing" (in the direction of motion) is, of course, quite small in this case, while the width is virtually endless, so that there is little loss of pressure due to "side flow" of the lubricant.

Mr. Castleman now assumes that oils used for engine lubrication cannot stand tension, so that cavitation is produced as soon as the pressure drops to zero. This leads to the conclusion that a tension is developed in the oil film on the trailing part of the ring face which is a mirror image of the pressure produced on the face of the leading part, whose intensity is limited to the prevailing "atmospheric" pressure under which the face of the ring works. The tension (shown by cross-batching in Fig. 1) will cancel an equal pressure in the film on the face of the leading part of the ring.

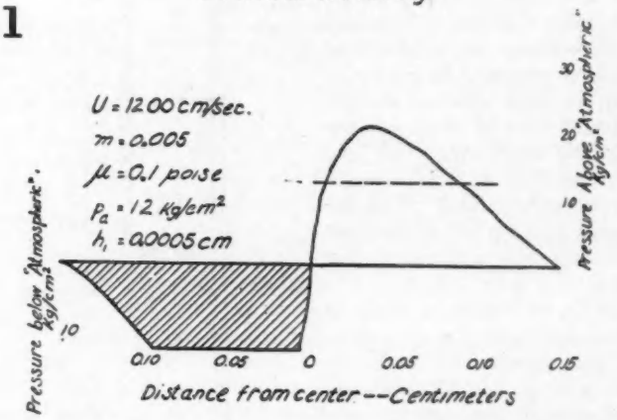
It has been shown that the gas pressure in the upper ring groove is approximately equal to the cylinder pressure. This is the "atmospheric" pressure under which the ring works, and this is canceled by an equal pressure on the face of the ring. It is therefore necessary only to consider the dynamic pressure developed by the motion of the ring. The net pressure supporting the ring against its elastic force is represented in the lower part of Fig. 1 by the area under the dynamic pressure curve and above the broken line. The absolute pressure on this section of the ring face attains a maximum value of twice the "atmospheric" pressure. This pressure is independent of the direction of motion.

The lower part of Fig. 1 represents average conditions of engine operation, engine speed being assumed to be 2400 r.p.m., the engine being under full load and the sliding speed calculated for a crank angle of 40 deg. The lubricating oil is assumed to have an absolute viscosity of 0.1 poise, which corresponds to medium grade oil with 6 per cent dilution and raised to a temperature of 185 deg. F. In this case the net effective oil pressure for a mean ring clearance of 0.00036 in. balances the elastic force of the ring. The calculations were made by means of Reynolds' equation for the pressure in an oil film.



Profile of worn ring

Fig. 1



Distribution of Dynamic Pressure Developed Under Ring Shown Above

Points from Peoria...

Fuel Injection Pumps

CHARACTERISTICS of fuel injection pumps and the adaptation of these pumps to engines with different types of combustion chamber were discussed in a paper by H. C. Edwards of the Timken Roller Bearing Co.

An important characteristic of such pumps is the variation of the fuel delivery per cycle with speed (for the same "throttle" setting). In a pump with ported barrel this is influenced by the different rate at which pressure builds up in the barrel just prior to closing of the port, at high and low speeds respectively. At low speed the pressure probably becomes high enough to start delivery only when the port is completely closed, whereas at high speeds the greater wire-drawing effect of the port causes the pressure to build up more rapidly, with the result that delivery starts before the port is fully closed and the effective stroke is virtually lengthened. Whatever leakage there may be past the plunger, also will be greater at low than at high speeds, and both of these factors tend to produce a torque curve which drops away at low speeds.

Two types of pump cam were discussed, both acting directly on the mushroom heads of the pump plungers. One of these, a socalled "constant-velocity" cam, provides a period of constant velocity of lift between the accelerating and decelerating periods (acceleration over roughly 15 degs. of cam motion, constant velocity over 15 degs. and deceleration over 35 degs.). With this long period of deceleration it is possible to use a relatively light spring. With the cam rotating at 1250 r.p.m., at the point where the inertia load approaches the spring force most closely, the latter has a value of 36 lb. as compared with 19 lb. inertia load, so there is a safe margin holding the plunger down to the cam contour, and that with a spring exerting a maximum pressure of only 49 lb. The constant velocity imparted to the plunger during an intermediate part of the lift is 5.7 ft. per sec. Injection takes place during this period of constant lift velocity, so that when there is a heavy hydraulic load on the cam surfaces there is no additional inertia load. The second cam does not have the constant-velocity feature but accelerates and decelerates the plunger during nearly equal periods and imparts to it a maximum velocity equal to the constant velocity obtained with the first cam. Both cams have a lift of ⅜ in. Theoretically, injection starts when the port closes, which is 0.080 in. from the beginning of lift with the first, and 0.088 in. with the second cam.

In discussing the adaptation of the pump to the engine, four different engine types were considered, as follows:

1. Direct-injection engine, for which the duration of injection must be short, atomization very fine, and penetration moderate. This calls for good control over the rate of injection. A multi-hole nozzle would probably be most satisfactory.

2. A combination direct-injection and air-cell, which requires fast injection. Atomization need not be so thorough, but high penetration and good control over the rate of fuel entry are essential. A single-hole nozzle is indicated for this type.

3. A precombustion chamber without turbulence requires fairly fast injection, fair atomization, low penetration, and fair control over the rate of fuel entry. A large pintle nozzle is the proper type.

4. A precombustion chamber with high turbulence functions best with a

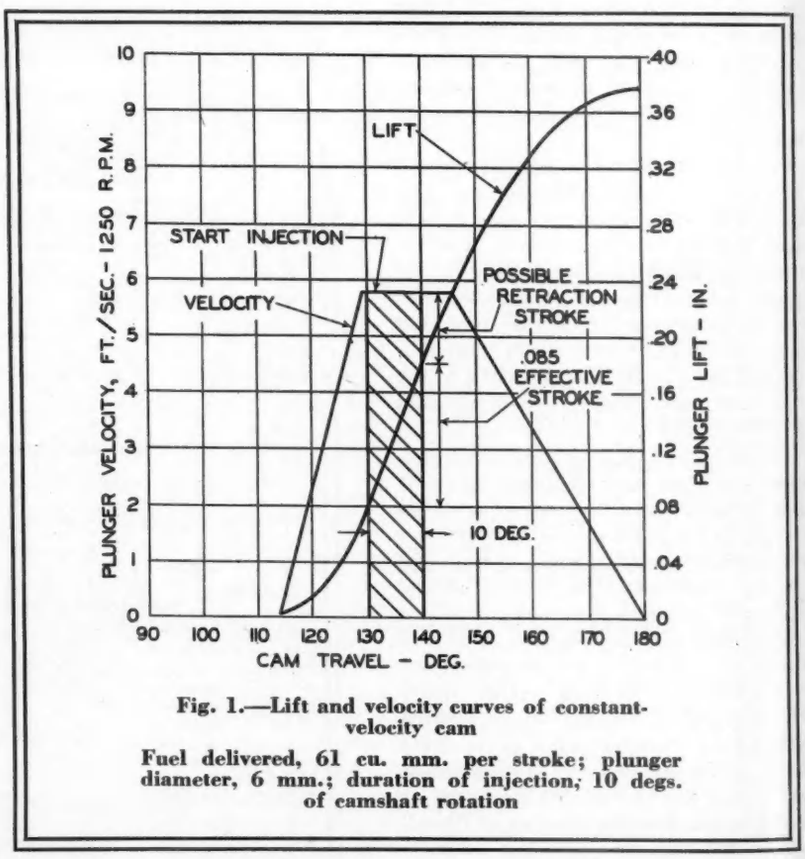


Fig. 1.—Lift and velocity curves of constant-velocity cam

Fuel delivered, 61 cu. mm. per stroke; plunger diameter, 6 mm.; duration of injection, 10 degs. of camshaft rotation

Papers presented at the S A E National Tractor and Industrial Power Meeting bring out many phases of Diesel design and maintenance

moderate duration of injection. Good atomization, low penetration, and fair control over the rate of fuel entry are essential. A moderate-sized pintle nozzle is indicated.

In discussing the adaptation of the pump to the various engine types, engines developing 100 hp. at 2500 r.p.m. were considered in all cases (six-cylinder 4 by 4¾ in., 357 cu. in. displacement, with fuel consumptions of 0.53 lb. per hp-hr. at 400 r.p.m.; 0.50 lb. at 2500 r.p.m., and a minimum consumption of 0.43 lb. per hp-hr.

When the engine develops 100 hp. and consumes 0.50 lb. of fuel per hp-hr., the hourly consumption is 50 lb. A fuel oil having a specific gravity of 0.827 occupies about 550,000 cu. mm. per pound, and this is a constant that comes in handy in determining the fuel delivery per stroke, which is given by the equation

$$D = \frac{550{,}000 \times f}{60 \times n \times m} \text{ cu. mm.},$$

where f is the consumption per hour; n, the speed of the pumpshaft in r.p.m., and m, the number of pump strokes per camshaft revolution.

In this case the required delivery figures out to 61 cu. mm. per pump stroke.

A direct-injection combustion chamber will require an injection period of from 12 to 15 degs. of crankshaft rotation. Taking the mean value of 13.5 degs., this corresponds to 6.7 degs. of pumpshaft rotation and 0.0009 second of elapsed time. If the "constant-velocity" cam is used, which gives a constant speed of lift of 5.7 ft. per sec. (1737 mm. per sec.) the required plunger area is

$$\frac{61}{1737 \times 0.0009} = 39 \text{ sq. mm.}$$

This is very nearly the area of a 7-mm. plunger, and its effective stroke is 0.0624 in. or 1.58 mm. The portion of the total cam lift of ⅜ in. which constitutes the effective stroke is indicated by the arrow-headed dimension line in Fig. 1. The port closes after the plunger has been lifted 0.080 in., and during the next 0.0624 in. of plunger travel 61 cu. mm. of oil is discharged through the delivery valve. With a plunger velocity of 1737 mm. per second it would be possible to inject 125 cu. mm. of fuel at this rate. However, tests indicate the necessity for a certain allowance for back flow through the delivery valve (up to 64 cu. mm.) to reduce line surges, produce good idling or to maintain true injection.

There is some advantage in using the variable-velocity cam for direct-injection engines without turbulence, as with this the velocity of injection and the penetration of the spray increase as injection proceeds. In that case, however, a plunger of larger diameter is required, as the mean plunger velocity is less than the constant velocity of the cam previously considered. Port closing occurs at 4.6 ft. per sec., so the effective delivery must be shifted to occur at higher velocities near the peak of the cam. This is accomplished by using a delivery valve with some retraction volume.

Using a 7.5-mm, plunger, the maximum velocity becomes 6.66 ft. per sec., which is enough to give a mean velocity of 5.7 ft. per sec. This mean velocity corresponds to 0.146 in. lift, and by dividing the effective lift of 0.054 in. for this plunger equally between both sides of the mean point, injection starts at

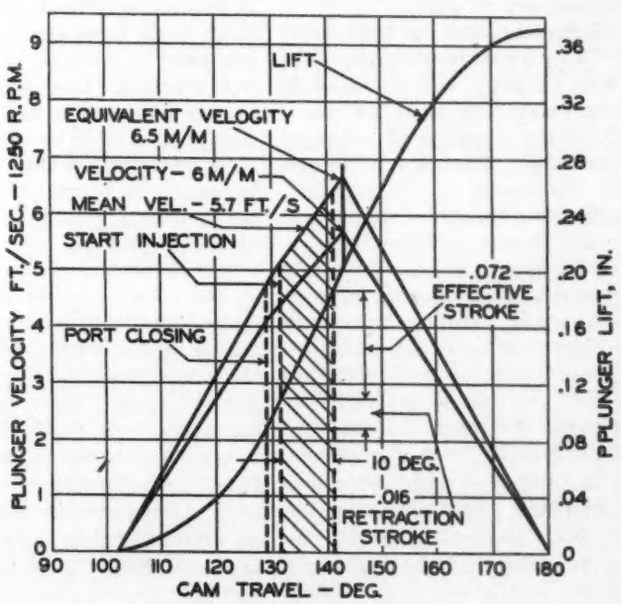


Fig. 2—Lift and velocity curves of variable-velocity cam

Fuel delivered, 61 cu. mm. per stroke; plunger diameter, 6.5 mm.; duration of injection, 10 degs. of camshaft rotation

Specifications for Fuel Pumps for Four Engine Types

Horse power—100
Fuel lbs. per hour—50
Engine sped—2500 R.P.M.
Fuel per stroke—61 mm.³
Cam speed—1250 R.P.M.

COMBUSTION CHAMBER	No. 1	No. 2	No. 3	No. 4
Crankshaft duration	13.5°	13.5°	20°	20°
Plunger velocity	5.7 F.P.S.	5.3-6.1 F.P.S.	5.7 F.P.S.	5-6.4 F.P.S.
Plunger diameter	7 mm.	7.5 mm.	6 mm.	6.5 mm.
Effective plunger lift	.0624 inch	.054 inch	.085 inch	.072 inch
Possible retraction	up to 6.4 mm.	3.5 mm. fixed	up to 3.1 mm.	13.6 mm. fixed

0.119 in. and ends at O. 173-in. lift. From this it follows that the start of injection must be delayed by an angle which corresponds to the difference between lifts of 0.119 and 0.888 in., or 0.031 in., beyond the point of port closing, by making use of delivery-valve-retraction volume.

The constant-velocity cam seems to be the better of the two, for even if the cam velocity should be increased, the other cam would still be at a disadvantage because of the relation between the delivery valve and the cam contour. The retraction volume required to give the desired plunger velocity might not produce the delivery characteristic corresponding to the desired torque-speed relation.

The plunger and cam for combustion chamber No. 2 (combination direct injection and air cell), will be identical with the corresponding parts for No. 1, inasmuch as the duration of injection will be the same. The only difference will be in the nozzle.

For combustion chambers Nos. 3 and 4 a slightly slower injection rate is desirable—20 degs. on the crankshaft. In the precombustion chamber without turbulence, actual burning rates are controlled by the efflux of the partially-burnt charge from the precombustion chamber into the cylinder as much as by the plunger and cam. In the precombustion chamber with turbulence, the burning rate is largely controlled by the turbulence. In each particular case the nozzle used is of great importance, on account of the throttling action of the nozzle pressure loading device and its orifice.

Specifications for fuel-injection installations for the four types of engine are collected in the above tables, the first of which contains the values which are common to all four while the second contains the values which differ for the four engines:

Summarizing the foregoing discussion, it will be seen that in the case of the constant-velocity cam, selection of the proper plunger size will assure obtaining the theoretically required duration of injection. With the variable-velocity cam not only must the plunger size be selected in each case, but, in addition, the delivery valve must be selected to fit the variable velocity to the duration of injection. With constant-velocity cams the delivery valves can be adjusted carefully to take care of delivery-line-pressure relief and of pressure surges, together with the control of delivery over a range of speeds. With the variable-velocity cam, on the other hand, the delivery valve has an additional function to perform, that of delaying injection to give the proper velocity. Fixing this delay period on the delivery valve greatly hampers its use as a device for line-surge control and the control of the speed-delivery characteristic of the pump.

Diesel Maintenance

SERVICE requirements of injection pumps result for the most part from dirt entering the pump with the fuel, said R. J. Kretz of I. H. C.'s Service Division in a paper on "Servicing Diesel Engines." It is not advisable for the operator to store fuel for long periods in barrels (and then shake up the dirt in the barrel together with the gum that has formed and pour it all into the fuel tank). As regards straining the dirt out of fuel, the difficulty is to keep strainers functioning efficiently in spite of the dirt that collects on them. The only practical way to determine when parts of the injection pump should be replaced is to test them under high pressure (5000 to 6000 lb. per sq. in.) and set a certain number of drops per minute as the maximum allowable leakage.

With improvement in design, failure of the nozzles due to the plugging of their spray holes with carbon has ceased to be a factor, at least with the prechamber type of engine. The improvements consisted in providing the nozzle with as large spray orifices as possible without impairing its nozzle function; mounting it in such a way as to prevent overheating, and reducing the number of close-fitting parts (which are most likely to be affected by the heat and dirt) to a minimum. The chief causes of service on nozzles are breakage of parts, mainly springs and valve stems, and clogging of the nozzle filter, which is likely to occur when the main filter is not properly serviced.

Trouble from dilution of crankcase oil is very rare and occurs only when, through some mechanical defect, the engine misfires. There has been some trouble, however, from thickening of the crankcase oil, due to excessive blowby. This, it seems, allows solid carbon to pass the pistons and produce a mechanical mixture of soot and oil.

The need for service to the piston rings or renewal of the rings usually becomes evident through excessive oil consumption. In the I. H. C. engines oil control is effected by means of two scraper rings and a series of bleeder holes in the piston-ring grooves. The upper oil ring is of the double-duty, the lower of the single-duty type. Usually, when the pistons are removed for service to the rings, new rings are installed after the grooves and the bleeder holes have been cleaned of carbon, and as a rule, two double-duty scraper rings are installed to take the place of one double-duty and one single-duty.

Pistons made of Lo-Ex aluminum alloy with a special high-chromium alloy steel plate set into the head have proven very satisfactory in service. The theory is that the plate keeps heat away from the piston rings. Whenever cylinder sleeves are renewed, the pistons also are renewed, which has the advantage that pistons and liners are factory-matched and -fitted.

At first rapid wear of cylinder bores gave service departments real concern, but there has been rapid progress in liner materials and machining methods, and the alloy irons now used (nickel-chromium-molybdenum) give as much as five times the life of ordinary cast iron. The liners are finished by a very smooth honing operation. Crankshaft journals are hardened to reduce their rate of wear.

Lubrication

FORMERLY the stability of an engine oil, as determined by laboratory tests of the new oil and of oil taken from a crankcase after use, was regarded as a suitable criterion for appraising the value of the oil as a lubricant, but recent developments in engine practice have suggested that the proper basis for the classification of lubricants is engine performance and maintenance cost. C. M. Larson, supervising engineer of the Sinclair Refining Co., in a paper on the effects of addition agents, reported results of tests made in the East Chicago laboratory of the Sinclair Refining Co. with various types of lubricant in a single-cylinder Caterpillar Diesel test engine. Tests were made with the following lubricants: Highly-treated stable paraffinic oil, Gulf-Coast lubricant, Smackover high-sulfur lubricant, 42 per cent raffinate from solvent treat on Gulf Coast lubricant, and Gulf Coast plus 1.33 per cent C. P. S. (Tenol compound).

The various oils were used in the engine, which was run under a load of 16.8 hp. (75 lb. per sq. in. b.m.e.p.) at 850 r.p.m. and note was made of the total hours run, the rate of oil consumption, the reason the engine was shut down, inspections, condition of filter at end of test, and cylinder wear at end of test.

The Tenol compound was tested in all kinds of base oil but the best results were obtained when it was used with Gulf Coast naphthenic-base oils. There was no blowby discoloration on the skirt of the aluminum piston, the ring lands were clean and bright, and the crankcase was unusually clean. Liner wear was less than 0.0008 in. per 1000 hours and there was no appreciable increase in the blowby during the test run, which continued for 1093½ hours. Mr. Larson's conclusions from the test results were as follows:

"The future lubricant will be a very high stability hydrocarbon petroleum oil as the vehicle, to which will be added one to five per cent of proven addition agents. The selection of the base, whether paraffinic or naphthenic, will depend on the type of engine, gasoline or Diesel. The addition agent will not only be governed by the type of engine, gasoline or Diesel, but by the composition of the metals used. The use of babbitt bearings for Diesel engines is rapidly returning, as the proven addition agents used for Diesel engines are corrosive to lead bronze, high-lead and cadmium bearings. The use of 3 per cent tin in the bearing formula does help resist corrosion to a certain degree. The custom-made lubricant for high-output gasoline engines also is dependent on the design and materials entering into their respective construction."

Crankcase Ventilation

ONE fault to be found with the conventional crankcase ventilation system, in which air is allowed to enter through the breather tube and to escape through a road-draft tube or a tube to the carburetor air intake, is that the air flow which it provides is inadequate at idling, when ventilation is most needed, and excessive at high speeds, when it is least needed. W. W. Lowther of the Donaldson Company, Inc., in a paper on Crankcase Ventilation and Sludge, described a new crankcase-ventilating system which is free from that defect.

Moisture in the crankcase derives chiefly from the products of combustion in the blowby. The vapors of the blowby have a high dewpoint and deposit moisture on the cold surfaces of the crankcase. Condensation occurs more rapidly in cold than in warm weather. There is also more condensation during the warming-up period and at low speeds than after the engine has reached its normal working temperature.

Moisture in the oil causes a lot of trouble. It mixes with other elements to form sludge. It reacts with the sulfur to form a corrosive acid, and if it were not for the protective coating of oil, great damage would be done by the corrosive action of this acid. The emulsion of water and oil causes lubrication to break down. Because water is heavier than oil it collects at the bottom of the crankcase, and in cold weather it is likely to freeze. When the moisture content of

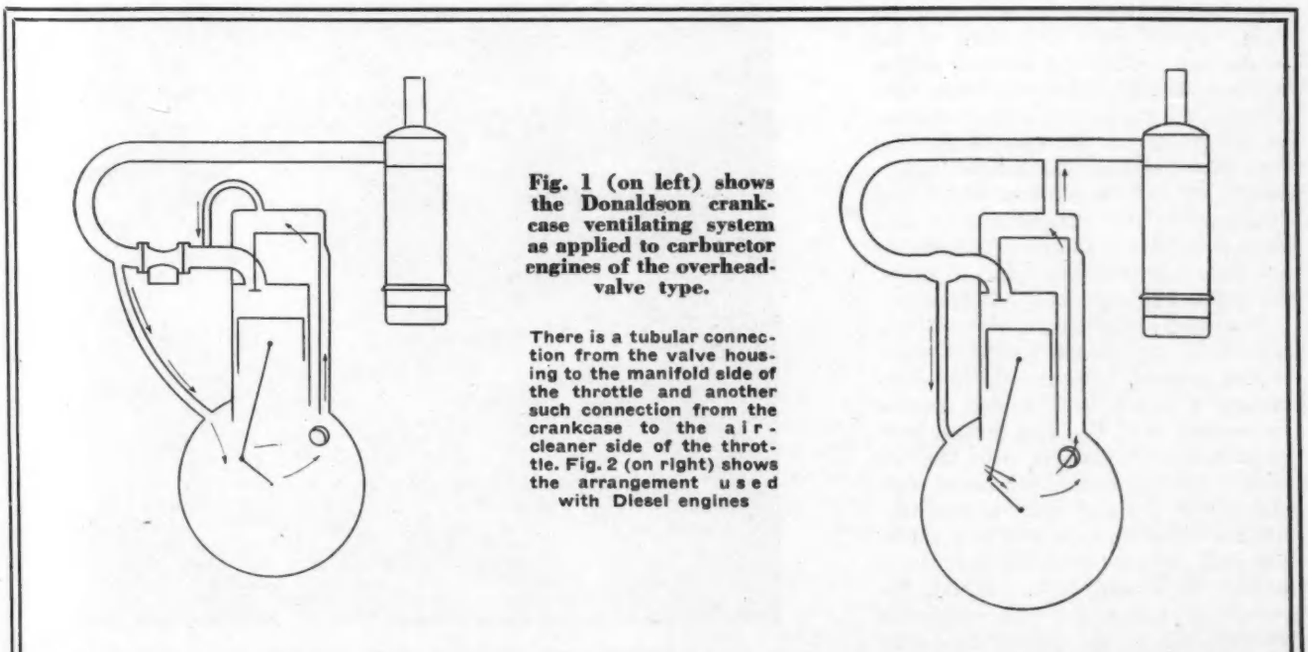


Fig. 1 (on left) shows the Donaldson crankcase ventilating system as applied to carburetor engines of the overhead-valve type.

There is a tubular connection from the valve housing to the manifold side of the throttle and another such connection from the crankcase to the air-cleaner side of the throttle. Fig. 2 (on right) shows the arrangement used with Diesel engines

oil reaches 5 per cent by volume, trouble is usually experienced from the oil-pump inlet freezing, thus shutting off the supply of oil to the bearings. Analysis has shown that late-model cars operating in cold weather have from a trace to 28 per cent by volume of water in the crankcase oil.

Dust also must be eliminated from the crankcase in order to improve conditions of lubrication.

The Donaldson ventilating system, described by Mr. Lowther, is claimed to effectively eliminate dust, water, acid and diluents from the crankcase oil. Advantage is taken of the pressure difference on opposite sides of the throttle valve, two tubes being run from the crankcase to the inlet pipe and connected to it on opposite sides of the throttle. When idling, the under pressure on the manifold side of the throttle is quite high, and this permits of rapid flow to that side even with a tube of small diameter. A larger tube is required for the connection to the air-cleaner side of the throttle, because it must pass the same amount of air under much less pressure difference. In operation, with a closed crankcase, the engine suction tends to create a vacuum in the crankcase through the small tube, and as a result atmospheric air enters through the large tube. This flow of air removes the moisture and blowby, and, moreover, it is not dependent on vehicle speed. In fact, the flow is greatest (slightly over 1.5 cu. ft. per minute) with the vehicle at a standstill, when there is no flow at all with the conventional system. Air is drawn off at the highest point of the crankcase, and there is no dome where vapors can linger and condense.

The same principle can be applied to Diesel engines, even though these do not have a throttle, by placing a check valve in the tube between the inlet manifold and the crankcase so it will open under the air-column surge which occurs every time the inlet valve closes. Under the resulting ramming effect, atmospheric air is forced into the crankcase, from which it is drawn off at the highest point by the air cleaner. Some operators, Mr. Lowther said, are averse to putting the crankcase under partial vacuum, fearing that it may result in dust being drawn in through leaky joints, etc., but he pointed out that even with the conventional system there is an intermittent vacuum in the crankcase.

Mr. Lowther stated that several cars equipped with this system had operated from 20,000 to 40,000 miles without the crankcase oil being changed, only new oil being added. Analysis of the oil, he said, showed no moisture or dirt. The oil became intensely black, containing as much as 4 per cent of free carbon, but it was his belief that this finely divided free carbon, which is held in suspension, was an aid to lubrication.

Hydraulic Starter for Aircraft Engine

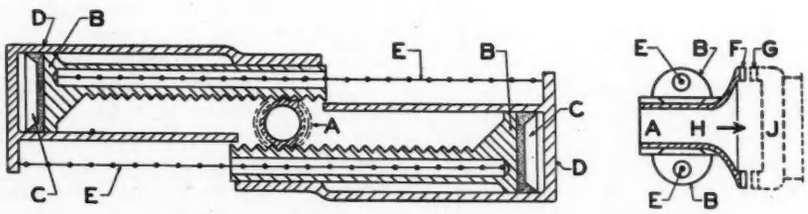
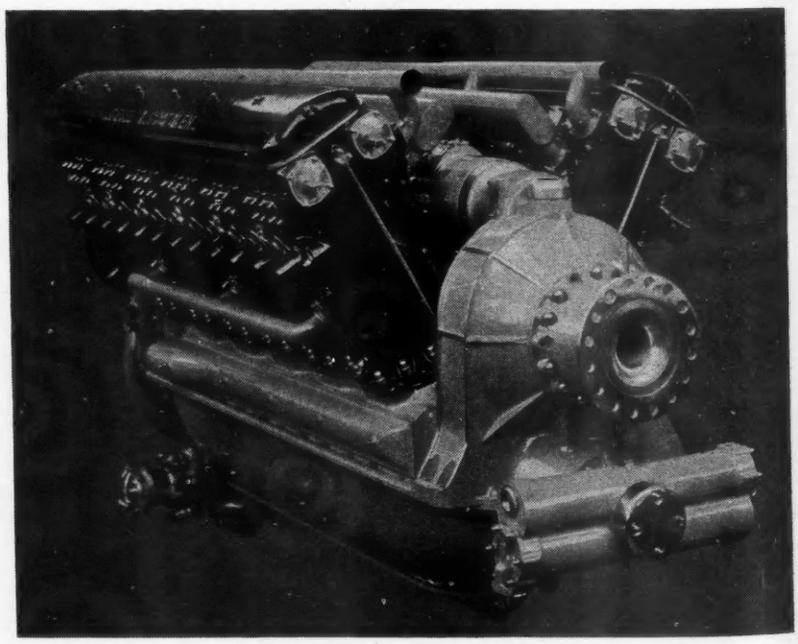


Diagram illustrating the operation of the Berger starter

A HYDRAULIC starter, built under Berger license, is used on the Louis Coatalen aircraft engine which was exhibited at the Paris aero show, and not a compressed air starter, as indicated. In the case of the 600 h.p. Diesel engine the starter has a length of 17.7 in., and a width and height of 5.5 in. Weight is 36 lb. and the torque 1040 lb.ft. These dimensions are four times greater than required for a gasoline engine.

Mounted opposite the end of the crankshaft, the Berger starter consists of two opposed cylinders *D*, each containing a piston with a stem having an inclined rack *B*. The central helicoidal pinion *A* engages with the two racks. The oil, maintained under high pressure in a small tank, is admitted into the cylinders by means of a three-way cock operated from the instrument board. By reason of the thrust, the pinion *A* moves forward, engaging with the claw on the end of the crankshaft and turns over the engine by reason of its rotation. At the end of the stroke the pinion *A* disengages and the two racks return to their original position by reason of the coil springs *E*. A spring-loaded ball locks the pinion in the central position. The oil used for the starting motor can also be employed for operating the landing carriage, brakes, or other parts of the plane.



Berger starter mounted on the Louis Coatalen aircraft engine.

An interesting application of the modern "electric eye" or photo-electric cell is illustrated in this machine for tempering steering knuckle king pins in the Pontiac Motors plant. The operator is reaching with his right hand for a king pin that has been tempered. Jaws (apart in this picture) clamp the pin in position. High electric current flows through section of pin between electrodes heating it quickly. As soon as heated section reaches proper white heat, the light projected by the heated part accentuates the sensitive electric eye, which shuts off the current and releases the jaws. Machine has a capacity of 300 pins per hour

Production Lines

Time Study

With the present tendency to guaranteed hourly and daily rates for factory work, time study requires some re-definition and, perhaps, assumes a different set of values. One factory manager now uses time study as a means of establishing a par for grading the ability of different workers on the same kind of job. It is plain to see that time study has a vital role in parts plant operation, since it serves as a check on costs and, consequently, on the level of sales price. In primary production plants such as automobile factories, time study may be used to check the level of cost on each operation and should enable the management to determine how closely they hew to the desired costs in line with the advertised price of the car. In all establishments, time study may be profitably used to determine the obsolescence of present production equipment and production process. And this would seem to be the most valuable potential of time study.

On Machinability

We have mentioned on occasion the factors involved in the machinability of metals. A definition of what is meant by machinability should be the start. We won't attempt a complete definition for many good reasons. However, it is important to appreciate the fact that machinability includes a concept both of tool life and satisfactory finish. Many jobs require long tool life; others demand fine finish. The two are seldom compatible for most metals, and one feature must be sacrificed to some extent in favor of the other. Actually, a complete conception of machinability must encompass — tool life, finish, machine speeds and feeds, character of tool and its material, selection of the correct type of cutting fluid, and the specific nature of the metallurgy of the material as it is presented to the cutting operation. Taken by and large, it is by no means a simple characteristic.

Skilled Men

Morgan Farrell, director, Chilton Bureau of Economic Research, points out in a recent bulletin the acute shortage of skilled men available to the metal working industry. The answer, obviously, is *training*. And many of the larger organizations have well-established apprentice training schools for the purpose. It's a serious problem for all industrial communities when you consider that four million persons came of working age during the past six years, not one of whom had worked at anything before. One way out for industrial communities is to follow the lead of Detroit where the employers banded together to form a central organization which could feed apprentices to cooperating employers whose set-up does not permit the establishment of an individual school system.

More Power

That new permanent magnetic alloy, Alnico, has such tremendous flux density when compared with other permanent magnets that it bids fair to revolutionize the design of important auto electrical equipment. For one thing, it permits the design of powerful radio speakers which take very little current. Somewhere in the future lies the possibility of developing a small, compact, but very powerful magneto which might be used on passenger cars and certainly on heavy-duty motorized equipment. The field for this type of magnet becomes most important when we consider the increasing electrical load in modern passenger cars as well as the increasing demand for a fat, hot spark. There is the prospect of reducing electrical load some six amperes by the use of this material—which is something well worth while.

Cast Dies

Do you read "Inco"? We recommend a reading of Vol. XIV, No. 4. It contains an article showing how the use of nickel cast iron dies for large automotive stampings reduced 9000 die shop hours to 3800. The story comes from the General Motors of Canada, Ltd. Imagine getting castings which in the rough will fit together within fractions of an inch, as-cast and before machining. They are file-finished within 1 to 1½ thousandths of an inch for final clearances.

Labor Listens

Good personal relationship with the working force still pays dividends despite unionization. Here is the case of a very good friend of ours who heads a company employing about 100 men in his shop. He has paid a fair wage and by careful time study has been able to set up rates that pay a bonus

(Turn to next page, please)

when the base rate is exceeded. It seems that during the recent unionization drive in Detroit, most of his men joined the union. Yet they have so much confidence in the head of the company that when the union attempted to shut the shop pending a closed shop contract they refused to sit down. In effect, they told their organizer that if the management promised to treat them fairly they would accept a verbal agreement. To us, this appears as a very bright incident in the labor experiment.

All-Welded

It is of interest to note the growing spread of the welding process throughout the automotive manufacturing industry. Recently we visited the Superior Trailer plant in Indianapolis. These people are proud of the fact that the entire chassis structure of the heavy-duty trailer is assembled by welding, using the electric arc exclusively. This method simplifies frame construction rather considerably since the cross-members may be joined to the side rails directly and without use of gussets. The only rivets are those used for attachment of spring hangers.

—J. G.

1000 Plymouth Flywheels in 7½ Hr. With New Gisholt Machines

SIXTEEN machines have been eliminated and two-thirds of the floor space has been reclaimed for other use in the flywheel department of the Plymouth Division of Chrysler Corp. These impressive results have been achieved by the installation of eight new Gisholt radial type Simplimatics which now produce as much as 24 machines of the old type. Over 1000 flywheels are produced in 7½ hrs. by combining in one operation, on one machine, what formerly required three operations on three machines.

Tools are arranged radially to the work on the new machines in order to permit the maximum number of cutting tools to operate simultaneously. Machines are equipped with a heavy carriage having a vertical face on which sturdy tool-slides are mounted close to the work piece with a minimum overhang of the tools. Cam segments, mounted on a single drum, control movement of the tool-slides. Segments can be changed to provide different timing of the slides for other work and different feeds.

The tooling includes a central boring and turning slide fed longitudinally, and two radially located slides on which tools are mounted for facing, recessing, forming, and chamfering.

The machining cycle is entirely automatic, it being necessary for the operator to move only one lever. The master carriage slide on which the tool-slides are mounted is traversed close to the work by air pressure. The spindle then starts to rotate and the cam-drum feeds the tools to required dimensions. Upon completion of the turning operations, tool-slides are returned to their starting positions on the master slide, after which the master carriage slide is quickly traversed back to its starting position, and the spindle is stopped. The machine is then ready for reloading.

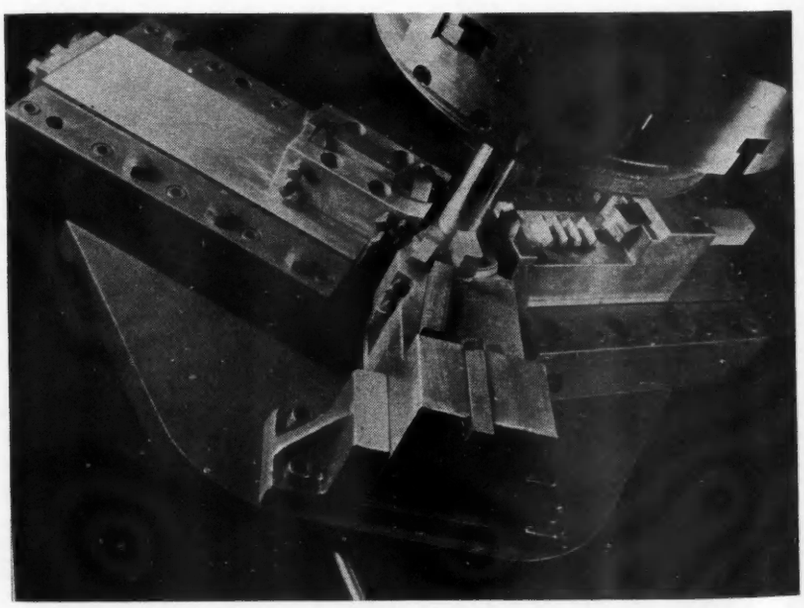
Cutting tools used on these machines remove approximately 3/32 in. of stock. The cutting speed is approximately 200 ft. per min., except for the final shaving operation which is performed at a speed of 100 ft. per min. A feed of about .03 in. per revolution has resulted in long tool life between grinds.

Flywheels are held in a three-jaw air-operated chuck. They are located on three pins in the chuck face and clamped around the circumferenee.

The safety factor is increased in these machines because the spindle does not revolve until the cutting tools are close to the work and the spindle is stopped as the master slide is quick-traversed from the work. The starting lever is at the top of the master slide, remote from any revolving parts. Complete automatic lubrication is provided for every important bearing and working surface on the machine.

The bed and headstock are cast from nickel semi-steel in the Gisholt foundry. The whole casting is rugged and heavily webbed to withstand increased cutting pressures accompanying the modern cutting tools and speeds being used. The headstock walls extend well above the spindle surrounding the spindle bearings with solid support. Heavy cross ribs inside the headstock provide center bearing seats and supply the strength required to maintain shaft alignment.

Full length hardened steel plates are securely attached to the bed ways and then ground in alignment with the spindle. The tool slide bearings are made extra wide and are also surfaced with hardened steel plates.



Close-up view of one of the new Gisholt radial type Simplimatics, showing tooling set-up for first operation in machining flywheels at the Plymouth plant. Fourteen modern cutting tools, which are held in the 3 radial slides, cut simultaneously to perform the necessary turning, facing, recessing, forming and chamfering operations

The Development of

Automatic Transmissions

By P. M. Heldt*

WE now come to the stepped automatic transmission, with either three or four definite ratios, in which the change from one ratio to another occurs either entirely automatically or is brought about by the operator by acting on the speed of the engine (by means of the accelerator) or on the speed of the car (by means of the brake). There are two devices of which quite extensive use is made in such transmissions. One is the automatic friction clutch, the other the overrunning or roller clutch.

There are two general types of automatic friction clutch, one being actuated by the centrifugal force on pivoted masses revolving with the flywheel, the other by the vacuum or suction in the inlet manifold. The conventional automobile friction clutch is normally held in engagement by springs, whereas the centrifugally-actuated automatic clutch is normally out of engagement. In the latter a number of centrifugal masses are arranged around the clutch, in the form of bellcranks. The pressure plate of the clutch is withdrawn by a spring, and when the engine is idling, the centrifugal force on the masses is insufficient to overcome the pressure of this spring. As the engine is speeded up, the centrifugal force increases with the square of the speed, and at a speed slightly above idling it overcomes the spring force and the clutch engages.

The vacuum-actuated automatic clutch is normally engaged, like the conventional foot-actuated clutch. When the engine is idled, the high vacuum in the inlet manifold, acting on a diaphragm or piston, withdraws the clutch against the force of its springs, but when the throttle is opened the vacuum in the inlet manifold decreases and the clutch is engaged again. To unclutch, all that is necessary is to remove the foot from the accelerator pedal. Vacuum-controlled clutches have been used to a certain extent in conjunction with conventional transmissions, for the reason that they make it unnecessary to unclutch by pedal before shifting gears; they are incorporated also in at least one automatic transmission, but with the latter type the centrifugally-actuated clutch is more extensively used.

The Sturtevant, which was the pioneer of this class of "self-shifting" transmissions, in its earliest and simplest form consisted of a train of four gears, arranged in substantially the same way as the first-reduction and intermediate-speed gears of a conventional transmission, combined with two automatic (centrifugal) clutches. When the engine was speeded up, one of the clutches, connected to the driving pinion of the transmission, would engage, and the car was then driven in low gear, that is, through the train of four gears. At a certain higher engine speed the second friction clutch engaged automatically. The driven member of this clutch was fastened to the main drive shaft, which extended entirely through the transmission, and the drive was then direct, this being made possible by providing an overrunning clutch in the gear meshing with the drive pinion. This car did not remain on the market very long, but whether its insuccess was due to faults in the transmission or to some other cause I have not been able to learn.

A semi-automatic transmission is being used on a considerable number of buses built by General Motors Truck Company and in service in New York and Chicago. An order for 225 such buses was placed by a large operating company and a service record of more than 2,000,000 miles has been piled up with them to date. This transmission, of which a longitudinal section is shown in Fig. 8, is of the so-called all-spur planetary type, but instead of making use of a band brake to lock one member of the planetary assembly to the housing to afford a point of reaction for the additional torque produced, it makes use of a roller clutch for the purpose. This prevents rotation of the part affected in one direction only, leaving it free to rotate in the opposite direction.

Yellow Coach

The transmission is not entirely automatic but is set for forward and reverse motion before starting the vehicle, while changes of gear are controlled by the accelerator pedal. By means of a lever located convenient to the operator, the sliding clutch member *A* can

Part Two

In this concluding instalment the author brings his subject to the present day. With Part One, which appeared in the issue of April 10, it forms a record of progress in the design of automatic transmissions.

* Presented at a meeting of the Philadelphia Section, S.A.E., Feb. 10, 1937.

be shifted into any of three different positions, "Forward," "Neutral," and "Reverse." In the drawing this clutch member *A* is shown in the neutral position, its teeth engaging solely with teeth on a hub projecting from a bulkhead of the transmission housing. For forward drive, clutch member *A* is shifted to the right so it will engage also with the teeth on the outer member of the roller clutch *B*, thereby locking this member to the housing. For reverse drive, clutch member *A* is shifted to the left. It then engages with the clutch member *C* which is splined to a hollow shaft formed integral with the pinion *D* of the planetary assembly.

The transmission proper receives its power from the engine through an automatic (centrifugally actuated) friction clutch. In the original design this was of the multiple disk type, but in the transmission on Yellow coaches it is of the expanding shoe type, the shoes being brought into engagement with the inner surface of the clutch drum by the action of centrifugal masses. Only the drum, *E*, of this clutch is shown in Fig. 8. From clutch drum *E* the power passes through the overrunning clutch *F* to the input shaft of the transmission, which has the gear *H* formed integral with it. Clutch member *A* being assumed to be in the "Forward" position, the planetary carrier *G* is held from rotation by the roller clutch *B*, as already explained, and power is transmitted through the gear train *H-I-J-K*, the last of these gears being integral with the output shaft *L*. This is the first forward speed, which is engaged by merely speeding up the engine.

It will be noticed that the planetary gearset has three pinions forming a single unit. The third pinion, *M*, meshes with gear *D* formed integral with a tubular shaft, which at its forward end carries a second automatic clutch *N*, of the jaw type. When the car is being driven in first gear the driven or rearward member of clutch *N* turns at a slower rate than the driving or forward member. After the car has attained a certain speed in low gear, the driver momentarily releases the accelerator pedal; this slows down the engine, and when the forward member of clutch *N* has slowed down to the same speed as the rear member, the clutch engages automatically. The drive is now through the train *D-M-J-K*. This makes the planetary pinions turn faster than they would be turned by pinion *H*, but the roller clutch *F* allows pinion *H* and its shaft to free-wheel.

With the transmission in second gear, if the accelerator is momentarily released, the engine slows down, gear *K* becomes the driver, and planetary carrier *G* is speeded up. This causes the centrifugal masses *O* to fly outward, and through the pins *P* and spring *Q*, shift the clutch member *R* to the right, thereby locking the planetary carrier *G* to the output shaft *L*. The gear is now in direct drive, the whole assembly rotating as a unit. If it is desired to shift to second from high without losing speed, this can be done by disengaging the planetary carrier *G* from the output shaft *L* manually by means of the throw-out shoe *S*. When this is done the transmission is in second gear again.

The reverse is also engaged manually. When sliding clutch *A* is engaged with clutch member *C*, gear *D* and its hollow shaft are held from rotation. Engagement of clutch member *C* is accompanied by disengagement of the outer member of roller clutch *B* by sliding clutch *A*, and the planetary carrier *G* therefore is now free to rotate in both directions. If the engine is now speeded up and the automatic clutch *E* takes hold, pinion *M* rolls around gear *D*, and driven gear *K*, which has a larger number of teeth than gear *D*, will revolve in the opposite direction to driving gear *H*, which has a smaller number of teeth than gear *D*. In this way the vehicle is moved in the backward direction.

This transmission was developed under patents issued to Oscar H. Banker of Chicago. Sole rights under these patents for coach applications were acquired by General Motors Truck & Coach, and all other rights by the Borg-Warner Corporation.

In the Macallen transmission, which was developed in Boston, the arrangement of the gears is substantially the same as in a conventional transmission (four pairs on parallel shafts), but three speeds forward are obtained semi-automatically by means of overrunning clutches. There are four of these overrunning clutches in the transmission, one being associated with each of the three forward speeds, while the fourth, located at the rear end, acts as a synchronizer for the direct drive and also makes it possible to use the engine as a brake when in direct drive. The overrunning clutches associated with the direct drive and the intermediate gear differ somewhat from the conventional and are referred to as torque-balancing mechanisms. An illustrated description of this transmission appeared in AUTOMOTIVE INDUSTRIES of June 24, 1933.

An automatic shift for conventional three-speed-and-reverse transmissions has been invented by D. C. Prince of the General Electric Company's Philadelphia Works and has been applied by him to a Plymouth car provided with a vacuum-operated automatic clutch and a free-wheeling unit. Shifting of the gears is effected by means of a coiled spring which is first put under tension by a vacuum cylinder communicating with the inlet manifold of the

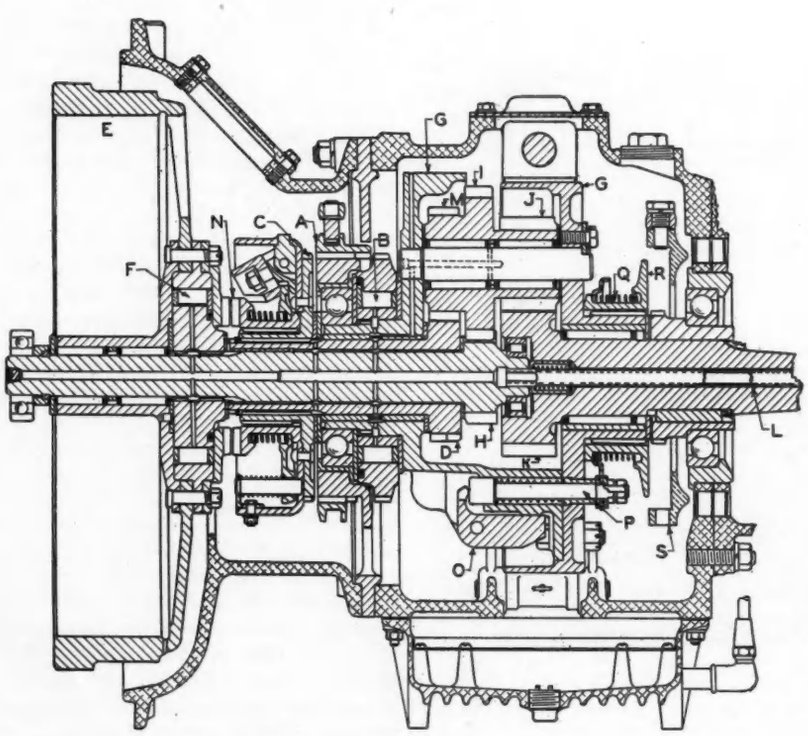


Fig. 8—Longitudinal section of Yellow Coach automatic shifting transmission. (Monodrive patents)

engine through a valve. There is one floating lever for each of the slider bars of the transmission, the connection between the lever and the slider bar being of the same type as in a conventional transmission. Sliding fulcrums are used for this lever, and in one embodiment of the invention these fulcrums are controlled directly by a centrifugal device similar to a centrifugal governor. The sliding fulcrums are in the form of sliding fingers which can be either moved outward so as to bring them into the path of the lever, or withdrawn therefrom. There are two such sliding fulcrums for each of the slider bars, and the arrangement is as shown diagrammatically in Fig. 10. The lever is under the influence of the vacuum cylinder and the coiled spring, both acting on it at the point indicated by the arrow. The coiled spring pulls it in the direction indicated by the arrow, while the vacuum cylinder pulls in the opposite direction. The mechanism illustrated in Fig. 9 is that operating the high and second-speed slider bar. To engage high gear, the upper fulcrum finger is moved out, the lever finds a fulcrum on it, and the slider bar is pulled to the left by the coil spring, thereby engaging the direct drive. To engage the intermediate gear, the upper fulcrum finger is withdrawn and the lower fulcrum moved out, and the pull of the coil spring then engages second gear. The fulcrum fingers are moved automatically by the centrifugal device (Fig. 10), which is under the influence of the car speed and of the accelerator pedal.

With the car at a standstill and the engine idling, the automatic friction clutch will be disengaged, owing to the high vacuum in the manifold. The various sliding fulcrums are "jammed" in their guides by the pressure on them of the springs which effect gear shifting. The driver now shifts the control lever to the "Forward" position. This

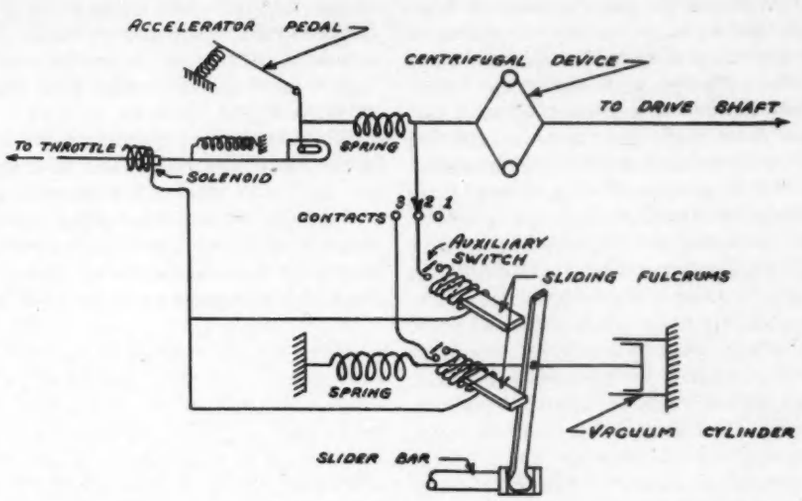


Fig. 10—Schematic drawing of Prince self-shifting transmission

closes an electrical contact and energizes a solenoid which in turn opens a valve in the line from the inlet manifold to the shifter cylinder. The piston of the shifter cylinder is drawn into it, thereby tensioning the shifter spring and releasing the fulcrum fingers, by drawing the shifter lever away from them. The fulcrum is now moved into a position (by a spring) where the shifter lever can engage it. At the same time the electrical contacts are opened so that the solenoid of the vacuum valve is deenergized, the piston in the shifter cylinder is released, and the spring pulls the low-speed gear into engagement. The pistons in the gearshift and the clutch vacuum cylinders are interconnected or interlocked, so that the clutch can engage only very lightly before the gears mesh. This prevents clashing of the gears and also obviates failure to mesh when neither gear is rotating.

As the driver depresses the accelerator pedal, the clutch engages and the car starts in first gear. With further acceleration the centrifugal unit will move into a position where the slider bar for the intermediate and high speeds can be engaged. When this motion of the selector mechanism takes place the contacts of the valve solenoid are again closed, vacuum is admitted to the shifter cylinder, the movable fulcrums for the high-speed and intermediary slider bar are released, the fulcrum is pulled into its active position by a spring, and the shifter spring then shifts the second-speed gear into engagement.

Before the shift can occur, the main clutch must be disengaged, and as this disengagement is effected by vacuum in the inlet manifold, this vacuum must be increased by closing the throttle. For this reason the throttle disk is made free on its shaft so that the throttle can be closed without change in the position of the accelerator pedal. It is closed by a solenoid which is energized by the same electrical contacts as the solenoid of the valve in the vacuum line. When the contacts are opened again the throttle automatically opens to the position determined by the position of the accelerator pedal. The main clutch will reengage and the car will continue to accelerate, this time in second gear.

Other changes of gear are effected in the same manner, the change depending on the relative positions of a number of levers with notches in them. One of these levers is the hand control lever, which has three positions, Forward, Neutral, and Reverse. The other levers are controlled by the centrifugal device. It should be mentioned here that the speeds at which changes of gear occur are not fixed, but vary with the position of the accelerator pedal. The spring of the centrifugal governor is interconnected with the accelerator in such a

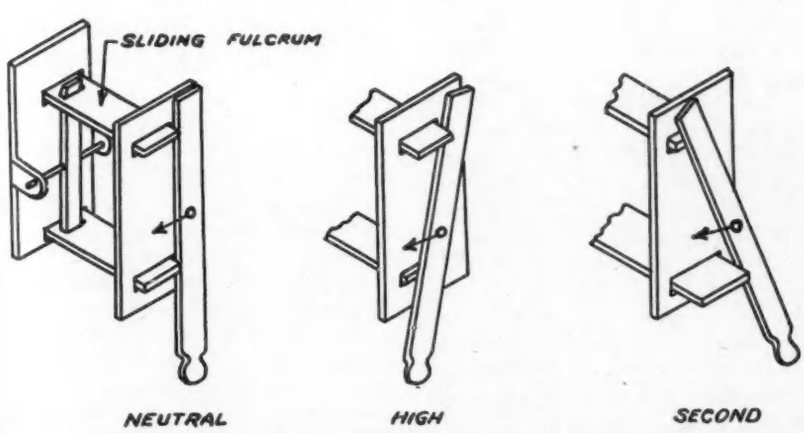


Fig. 9—Diagrams of sliding fulcrums of Prince self-shifting transmission

way that as the pedal is pressed down the tension in the governor spring is increased, and any given upward shift is then effected at a higher car speed. That the driver presses the pedal farther down indicates that more driving torque is needed, and the engine can deliver this greater driving torque more effectively through the lower gears. For instance, the Plymouth to which this transmission was fitted developed maximum torque up to 20 m.p.h. in low gear and up to 45 m.p.h. in second gear, and these speeds were therefore selected for shifting at wide-open throttle, whereas for moderate throttle openings it was found desirable to have the shift into high gear occur at 10-12 m.p.h. Conversely, when the car is slowing down on the level it is not desirable to change to a lower gear until the speed has dropped to 8-10 m.p.h., whereas on a hill the change from high to intermediate should occur at about 30 m.p.h. for best performance. These conditions are brought about automatically, because with the accelerator pedal depressed, maximum tension is exerted on the governor spring.

With this automatic shift, after the control lever has been set in the Forward position, speed control of the car is entirely by the accelerator pedal. There is no need for clutch operations under any conditions. In descending long hills, where it is desirable to use the engine as a brake, the gear can be locked. It is claimed that the mechanism is practically silent during changing operations and completely silent at all other times, and that it gives a selection of gears which closely approximates theoretical requirements.

The Tyler Unimatic Motorcar Control, developed in Detroit, comprises a three-speed transmission of the constant-mesh type, the various forward speeds being engaged by means of individual multiple-disk clutches actuated by the inlet-manifold vacuum. In addition to the clutches for the individual gears there is a main clutch which transmits the power for all of the gears. This main clutch is engaged last (and disengaged first), so that the transmission clutches, which are smaller, are not subjected to the wear and tear of engagement under load. A cylinder-and-piston unit operates the main clutch, while the transmission clutches are operated by diaphragm chambers. Admission of vacuum from the inlet manifold to the cylinder and the diaphragm chambers is controlled by a sliding valve under the influence of a centrifugal governor driven from the transmission tail shaft at a speed proportional to car speed. There is a vacuum-control button adjacent to the accelerator pedal, by means of which the car can be free-wheeled when the accelerator is held in the idling position, and in addition there is a master control button on the dash, which also serves to shut off the vacuum.

With the control button on the dash in the "automatic" position, as soon as the engine is started the vacuum-control sliding valve shifts to the position corresponding to low-gear operation. However, the engine being throttled, the high vacuum in the inlet manifold does not allow the friction clutches to be engaged (by their springs) and the car therefore does not start yet. The driver now presses down on the accelerator, the engine speeds up, the inlet-manifold vacuum decreases and the clutches engage, so that the car starts. After a certain speed has been attained, the centrifugal governor shifts the sliding valve to the position for second speed. As the valve is held in its various positions by spring plungers, it snaps from one position to the next. However, to allow the shift to take place, the driver must momentarily release the accelerator, so that the driving members are relieved of torque. The high gear is engaged in the same way. The reverse gear is engaged manually, and all forward speeds also can be engaged manually, by means of the conventional shift lever, if the control button on the dash is set in the "non-automatic" position.

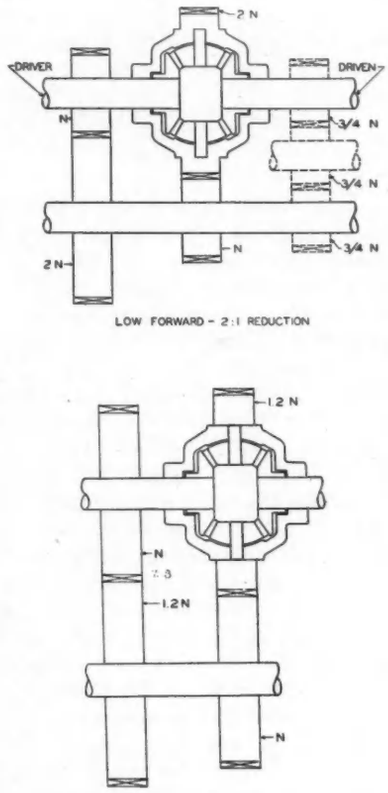


Fig. 11—Diagrams explaining principle of differential transmission

Differential Transmissions

Besides the automatic friction clutch and the overrunning clutch, the differential gear has a place in automatic transmissions. A good many inventors have been intrigued by the possibilities of the differential gear for this purpose. Imagine an ordinary rear-axle assembly. If the crown gear is held stationary and one axle shaft is set in motion, the other axle shaft will turn at the same speed in the opposite direction. There is a tendency for the crown gear to turn in the same direction as the driving axle shaft, and if it is allowed to rotate slowly in that direction, then the driven axle shaft will rotate less rapidly in the reverse direction. If the crown gear is allowed to rotate at one-half the speed of the driving axle shaft, then the other axle shaft will be stationary, and if the crown gear is made to rotate still faster, then the second axle shaft will reverse its direction of rotation. Thus it is possible, by controlling the speed of the crown gear, to cause the second axle shaft to pass through a wide speed range in both directions. In other words, any forward speed between the maximum and zero, as well as any reverse speed, can be obtained.

But how is the speed of the crown gear to be controlled? Many inventors have attempted to control it by friction, by applying a brake band to a drum connected to this gear. This, however, is quite impractical, for it can easily be shown that if the speed of the driven shaft is reduced by, say, one-half, then one-half of the power is wasted in overcoming friction. Besides, it would be quite impossible to assure accurate speed control with such a device, for if the frictional moment acting on the crown gear were less than the torque load on the driven axle shaft, the driven axle shaft would remain stationary and the crown gear would rotate at one-half

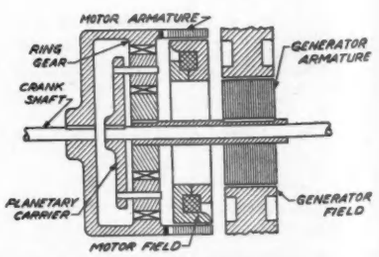


Fig. 12—Diagram explaining principle of electric differential transmission

the speed of the driving shaft. If the friction of the brake applied to the crown gear drum were now increased, as soon as the friction moment thus created exceeded that of the torque load, the crown gear would be stopped from rotation and the driven axle shaft would rotate at the same speed as the driving axle shaft (in the opposite direction).

In order to obtain a satisfactory degree of efficiency when transmitting power with a device of the type in question, it is necessary that the power absorbed by the crown gear when turning under the torque impressed on it, be returned to the transmission line. This can be accomplished by either mechanical, hydraulic, electric or pneumatic means, and the power may be returned from the crown gear to the driving shaft or it may be transmitted from the crown gear directly to the driven shaft.

Return of power from the crown gear to the transmission line by positive mechanical means is not practicable, because of the impossibility of an infinite variation of the gear ratio, but this method lends itself well to an illustration of the properties of the differential gear as a torque converter.

In Fig. 11 the diagram at the top shows a gear combination which gives a speed reduction of 2:1. The output shaft turns in the opposite direction to the input shaft, but this may be considered a forward drive. In this case the input shaft is connected to the crown gear by a train of gears which gives a reduction of 4:1, so that the crown gear turns in the same direction as the input shaft, but at one-fourth its speed. Power absorbed by the crown gear is returned to the input shaft. Instead of connecting the crown gear to the input shaft by gearing, we could connect it to the output shaft, as indicated in dotted lines, using an intermediate pinion, because the output shaft turns in the reverse direction to the crown gear. Also, as the output shaft turns at only one-half the speed of the input shaft, the gear reduction from the output shaft to the crown gear must be 2:1 instead of 4:1.

It is obvious that if we used either of these two arrangements and made the output shaft the input shaft, we should have an overdrive with a ratio of 1:2.

For a reverse drive it is necessary to make the crown gear turn faster than one half the speed of the input shaft, and in the same direction, which can be done by providing a gear train of the proportions shown on the lower diagram in Fig. 11.

The differential gear actually used in such transmissions is not the bevel-gear type commonly used in rear-axle drives, but a planetary combination consisting of a sun gear or pinion, a number of planetary pinions supported on studs extending from a planetary carrier, and a ring gear with internal teeth. This type of gear is free from end thrust, which would be rather bothersome if the ordinary bevel-type differential were used.

A differential transmission of the electric type is illustrated diagrammatically in Fig. 12. Here the ring gear is rigidly secured to the engine crankshaft and meshes with a number of planetary pinions supported on a planetary carrier mounted on the driven shaft. The latter is surrounded by a hollow shaft which carries the armature of an electric generator, and between the planetary assembly and the generator there is an electric motor whose armature is integral with the ring gear. The driven shaft is in driving connection with the car and therefore under load. When the engine is started up, the ring gear turns with it, the planetary carrier is held from rotation by its load, and the sun pinion therefore turns in the direction opposite to that of the engine. With it the generator armature revolves, and as a result a current is generated in it. This current is sent through the electric motor, and as the motor armature is carried by the ring gear, the motor torque is added to the engine torque. The combined torque will start the car, thus setting the planetary carrier in rotation, and the speed of the generator relative to that of the engine will then be reduced. At steady car speeds (when there is no acceleration) on the level the engine torque is sufficient to propel the car through the rear-axle gearing, and the planetary carrier will then rotate almost as fast as the crankshaft, so that the sun pinion and the generator armature rotate at only very low speeds. The electromotive force then generated is very low, and little of the power of the engine is converted into electric power, the greater part of it being transmitted directly. With a drive of this kind the efficiency therefore is higher than in a straight electric drive, where all of the power is converted into electric power in the generator and then converted back to mechanical power in the motor. With such a drive, speed control is by means of the engine throttle alone.

The electric generator in Fig. 12 could be replaced by some kind of pump and the electric motor by a hydraulic motor, and the principle would be essentially the same. Such differential hydraulic transmissions of both the hydrostatic and hydrodynamic type have been worked out. A hydrostatic differential transmission, based on the Wat-

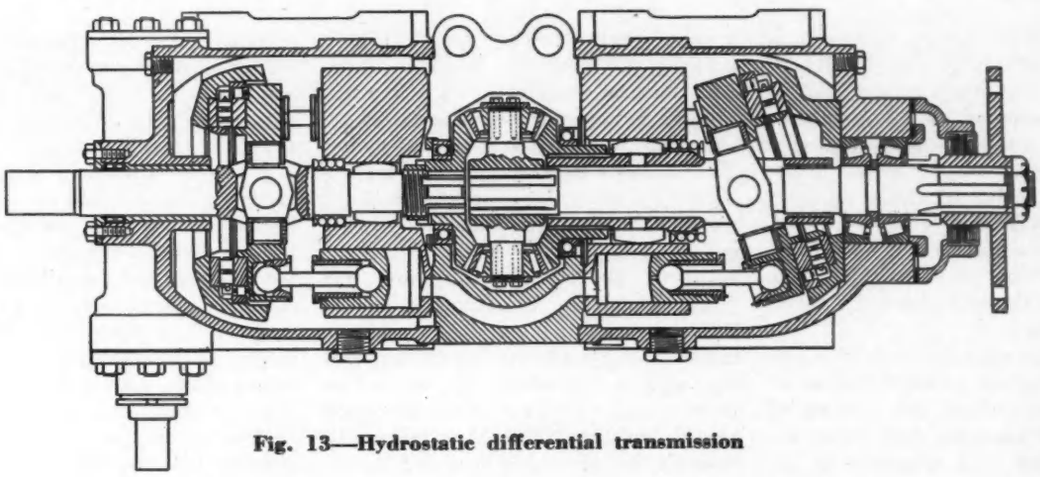


Fig. 13—Hydrostatic differential transmission

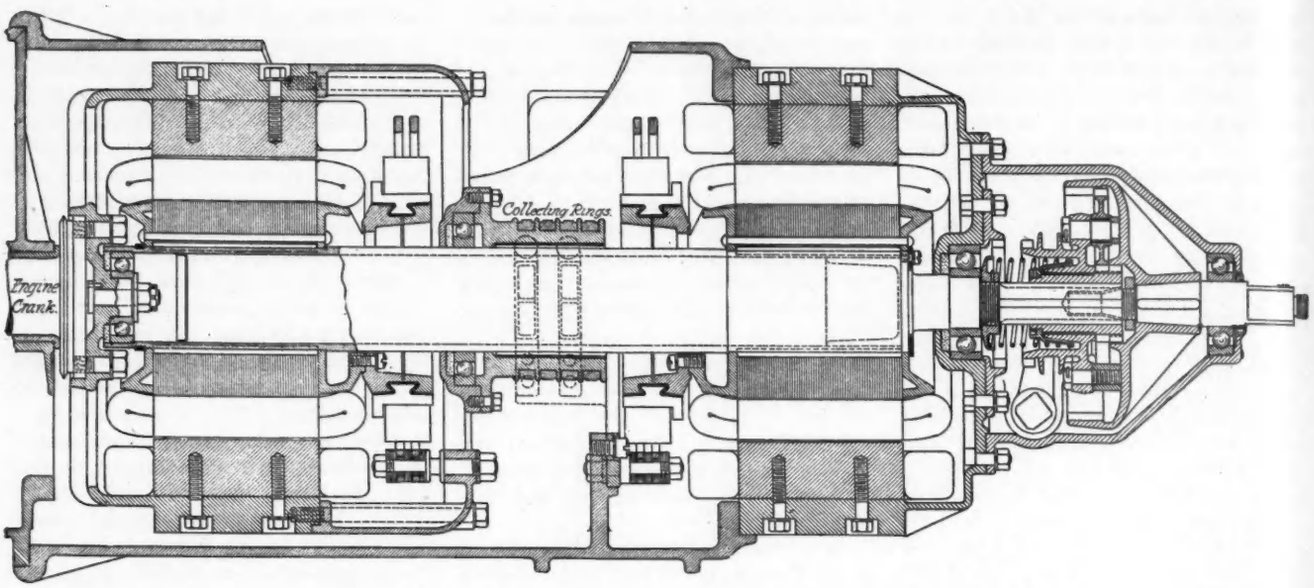


Fig. 14—Entz electric transmission of Owen Magnetic car

erbury hydraulic drive, is shown in longitudinal section in Fig. 13. It consists of the two Waterbury units, the pump and the motor, with a valve plate and a differential between them. The shafts of the two units, which in the conventional design of the Waterbury hydraulic transmission (Fig. 3) are independent of each other but have bearings in the central block, in this design are secured to the side gears of a bevel-type differential.

There is also another kind of transmission making use of the "feed-back" principle, but without the differential gear. In this case the differential action is produced by a magnetic or hydraulic coupling. The best example of this type is the Entz transmission, which was used for a number of years on the Owen Magnetic car. A sectional view of this transmission is shown in Fig. 14. It comprises two electrical machines arranged on the same axis, the one nearest the engine being referred to as a generator and the other as a motor. The field frame of the machine next to the engine is bolted to the flywheel flange of the engine and serves as its flywheel. The armatures of both machines are secured to a large tubular shaft mounted in ball bearings at opposite ends. This is really the driven shaft of the transmission, but a sliding type of reversing gear is incorporated between it and the propeller shaft.

When the engine is idling, the generator field, of course, revolves with it, but as the generator circuit is open there is no drag on the armature and there is therefore no torque on the driven shaft. The controller is then moved to the starting position, which connects the electric motor to the generator. Owing to the relative motion between the generator field and armature, an electromotive force is induced in the generator armature, and as a result a current flows through the motor. This causes a driving torque to be produced by both the generator and the motor. The magnetic drag between the generator field and armature is exactly equal to the engine torque, and this torque, therefore, is impressed on the hollow propeller shaft. The electric motor produces a torque of its own, and this also is impressed on the hollow driven shaft. As long as the car speed is still low there will be a large slip between the generator field and armature, with the result that a large e.m.f. is generated, the motor receives a large current and produces a heavy torque, which is good for acceleration. As the car gains speed, the slip of the generator armature decreases and with it the e.m.f. generated and the torque produced by the motor.

There are a number of different controller positions, and in the final or high-speed position the electrical connection between the generator and motor is broken and the generator is short-circuited upon itself. It then acts as a magnetic coupling, transmitting the torque of the engine directly to the driven shaft, with a slippage of only a few per cent, depending on the load.

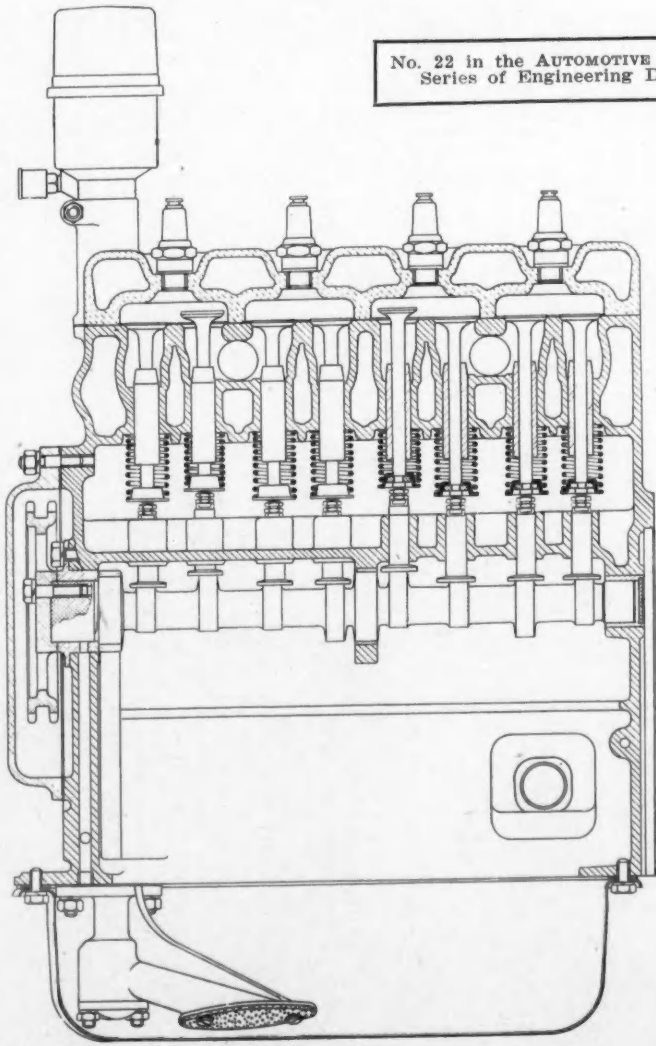
(The paper also included descriptions of the Electrogear and the Bendix Turbo Flywheel gear, both of which have been fully described in recent issues of AUTOMOTIVE INDUSTRIES.)

Standard Temperature for Limit-Gaging

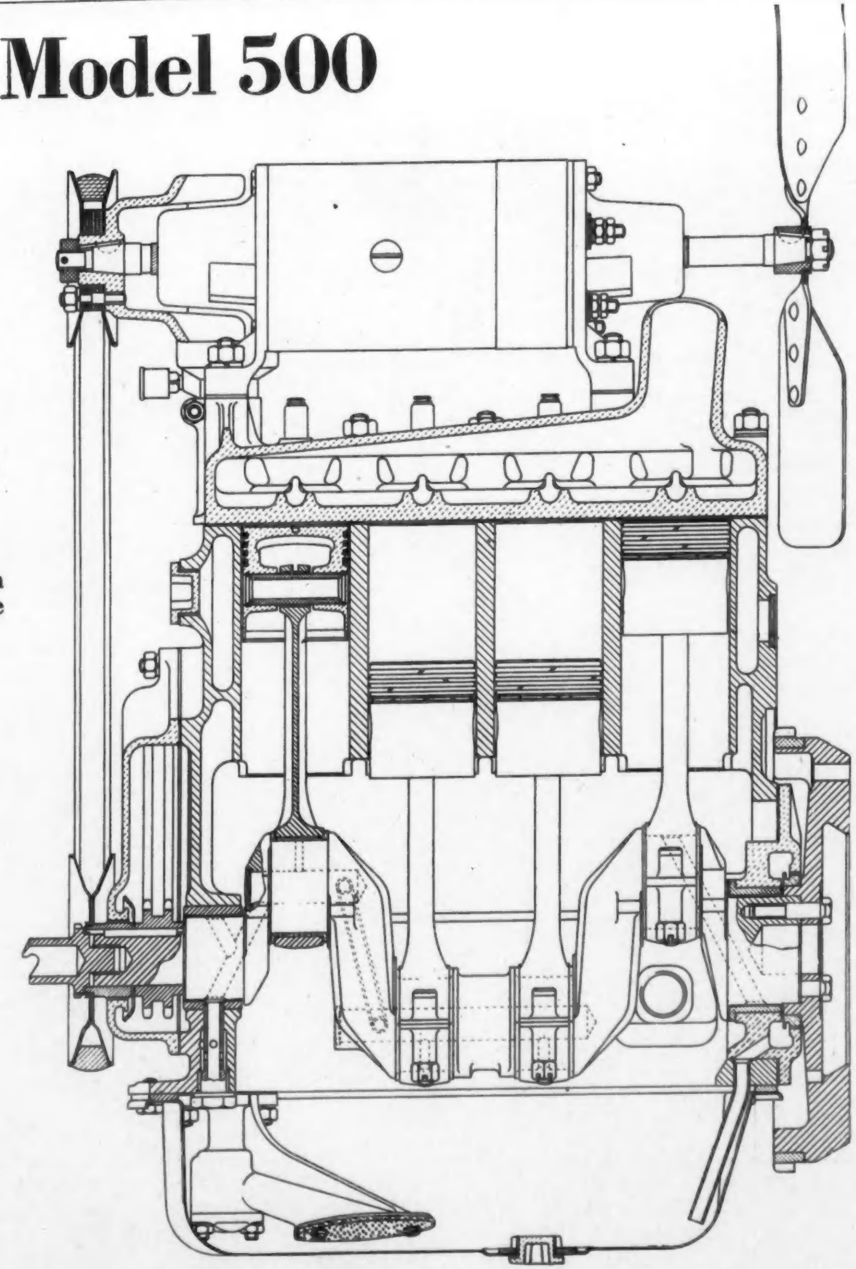
IN making accurate measurements or comparisons of length it is necessary to use a definite temperature to which the work and the gages used for checking must be brought before the measurement or the check is made. The temperature of 68 deg. Fahr. or 20 deg. Cent. has now been adopted as the standard reference temperature for this purpose by 33 different nations, including all of the important industrial nations. This temperature was adopted in 1925 in the American Tentative Standard for Tolerances, Allowances and Gages for Metal Fits. It was also advocated, during the same year, by a technical committee of the International Standards Association. In 1927 the matter of a reference temperature came up before the International Committee on Weights and Measures. This committee had five members, four of them representing the U. S., Great Britain, Germany and France. France had been using a reference temperature of 0 deg. Fahr., and Great Britain, 62 deg. Fahr. up to that time. Both of these nations agreed to change over to 68 deg. Fahr., and as a result the International Committee on Weights and Measures decided to recommend 68 deg. as the reference temperature for industrial measurements.

Fiat Engine, Model 500

No. 22 in the AUTOMOTIVE INDUSTRIES Series of Engineering Drawings

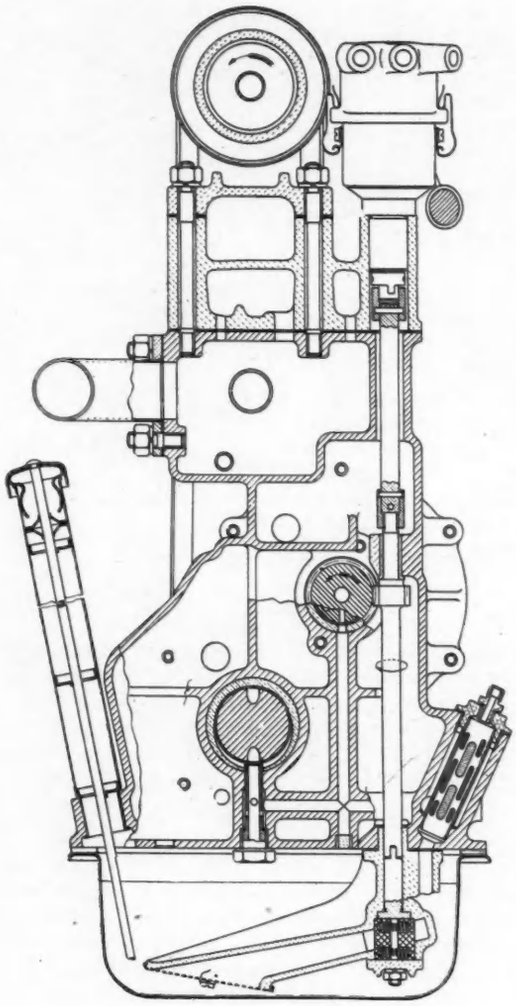


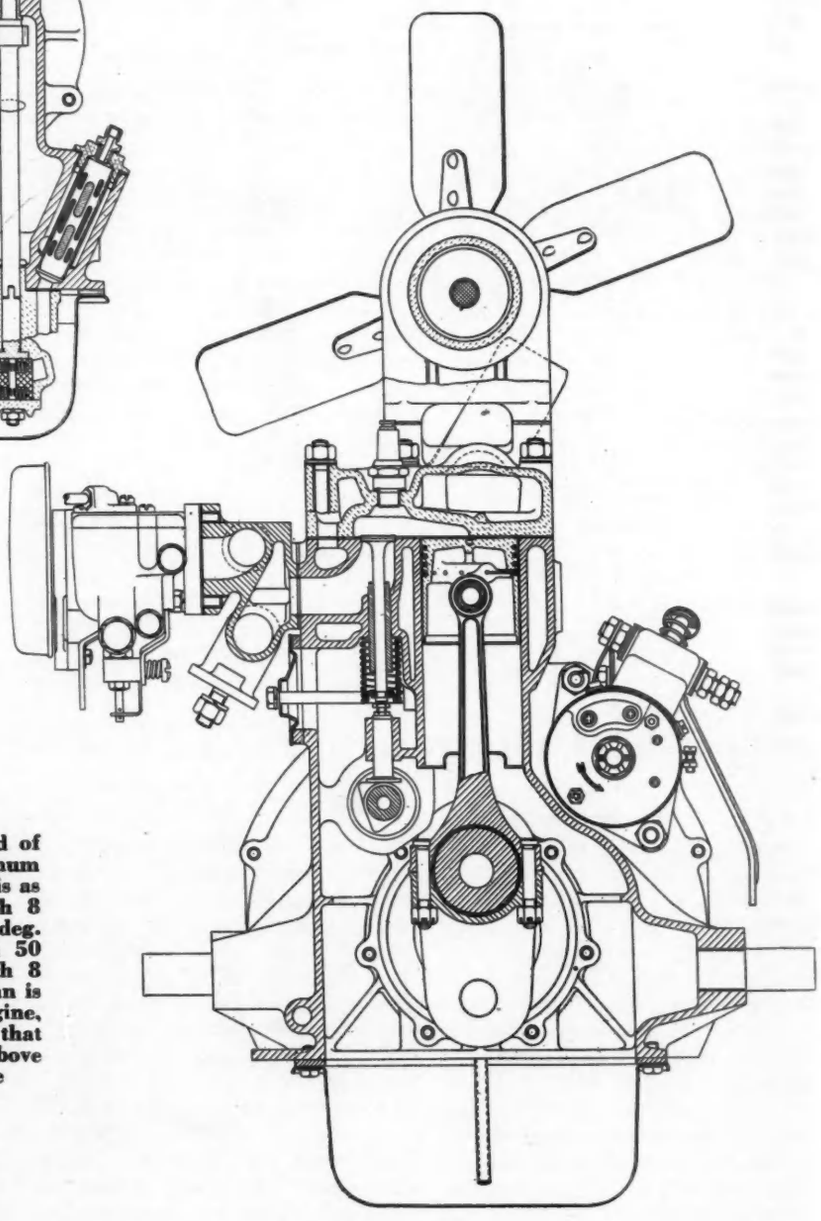
See description on the next page



Fiat Engine, Model 500

This is said to be the world's smallest automobile engine. It is a four-cylinder design with a bore and stroke of 52 by 67 mm. (2.047 by 2.638 in.) and has a piston displacement of 34.7 cu. in. The compression ratio is 6.5 and the engine is rated 13 hp. at 4000 r.p.m. This corresponds to a b.m.e.p. at rated output of 74 lb. per sq. in.





Pistons and cylinder head of this engine are of aluminum alloy. The valve timing is as follows: Inlet opens with 8 deg. lead; closes with 50 deg. lag; exhaust opens with 50 deg. lead and closes with 8 deg. lag. Note that the fan is at the rear end of the engine, which is due to the fact that the radiator is mounted above and behind the engine

New DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

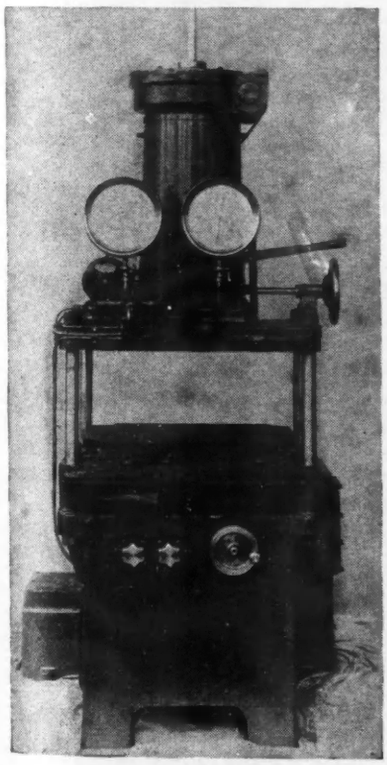
Calibrating Preload

Anti-Friction Bearings Measured By Chambersburg Hydraulic Press

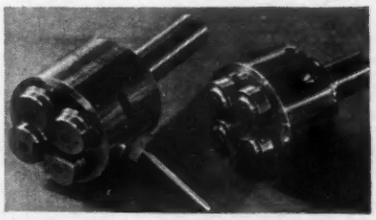
A press for measuring bearings under varying predetermined loads has been developed by the Chambersburg Engineering Co., Chambersburg, Pa. The press consists of a framework embodying a moving-up platen and a fixed cap carrying a spindle rotating mechanism and spindle positioning device. A spindle on top of the press, which is driven by a ¼ hp. motor through vee belt drive, rotates at 10 r.p.m. This spindle is raised and lowered by a counter balanced hand wheel, and can be locked in position when test bearings are in place.

A hydraulic unit mounted at the rear of the press will exert a pressure variable from 100 lb. to 10,000 lb. on a moving-up type table, this pressure being available at any portion of a 14-in. stroke and the valving so arranged that predetermined pressure may be maintained over any period of time.

Gages are calibrated after fixtures are installed so that accurate determination of total exerted pressures may be obtained. The pressure gages are arranged so that the lower pressures, up to 6000 lb., are read on one gage which automatically shuts off when the limit is reached, pressures over 6000 lb. being indicated on the second gage which ranges up to 10,000 lb.



Chambersburg hydraulic press for measuring bearings under varying predetermined loads



National Acme hollow-end milling tool designed to use circular cutters

Milling Tool

National Acme Development Uses Circular Cutters

A hollow-end milling tool which is designed to use circular cutters has been developed by the National Acme Co., Cleveland, Ohio.

By using more than one step on the cutters, it is possible to turn several diameters with one pass. After the tool has completed the cut, the cutters are automatically released and backed off without marring the work. Adjustment for diameter is provided in the tool.

The cutters are sharpened much the same as ordinary cutters, but are set after sharpening by means of a micrometer gage to insure even distribution of the cut.

The tool holder may also be used as a standard self-opening automatic die head by changing from hollow milling cutters to circular chasers. In this way, either milling cutters, circular chasers, or a combination of both may be used in these tool heads.

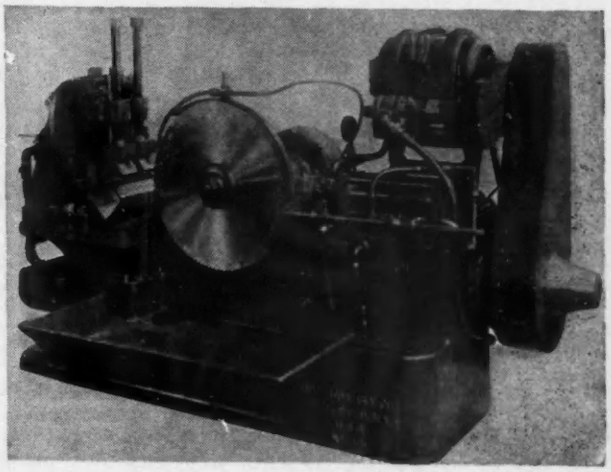
Cold Saw

Cochrane-Bly Machine for Cutting Non-Ferrous Tubing and Bars

For the rapid cutting of non-ferrous tubing and bars, the Cochrane-Bly Co., Rochester, N. Y., has brought out a high-speed machine having a four-speed sliding gear transmission through hardened alloy steel gears, hardened steel worm, phosphorus bronze worm gear running in oil, and all drive shafts mounted in anti-friction bearings.

Remote control is provided for changing the saw speeds from 235 to 600 ft. per min. cutting speed, and the hydraulic feed is adjustable up to 60 in. per min. The machine has automatic trip and rapid return of the carriage, and also rapid forward traverse of the carriage. Adjustable stops regulate the carriage travel to the size of tube being cut.

The new unit has an hydraulically operated vise with compound toggle link and vertical slide carrying adjustable clamp screws on each side of the saw blade. These screws are fitted with removable Vee or radius blocks to prevent distortion of thin



Cochrane-Bly cold saw for cutting non-ferrous tubing and bars. Machine handles 8-in. diameter tubes in 8 sec. cutting time

walled tubing under clamping pressure.

According to the manufacturer, the machine handles tubes up to 8 in. in diameter in eight seconds cutting time.

Lapping Equipment

Two Norton Machines Developed for Crankshafts and Camshafts

Two machines for lapping all bearing surfaces on crankshafts and camshafts have been announced by the Norton Co., Worcester, Mass. Trade names of these machines are Crank-O-Lap and Cam-O-Lap.

The lapping on frame of the Crank-O-Lap machine is pivoted and carries a bar, to which guides for the arms are fastened, and also a shaft for spools of abrasive paper strip. Lapping arms are jointed so they will follow the pins of a crankshaft as it revolves. Take-up spools for winding the used abrasive strip are carried at the ends of the arms and operated by rachets and pawls.

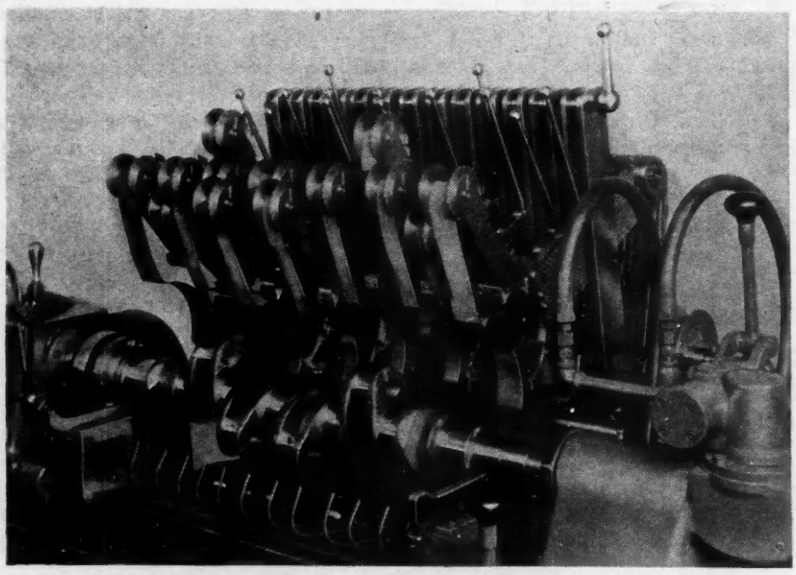
Actual lapping of each pin and bearing is done by shoes of the correct form which hold the abrasive strip firmly in place against the surfaces to be lapped. Lapping lubricant is automatically pumped on the revolving work.

The difference in the Crank-O-Lap and the Cam-O-Lap machines are in the application of the abrasive strips and action of the lapping arms.

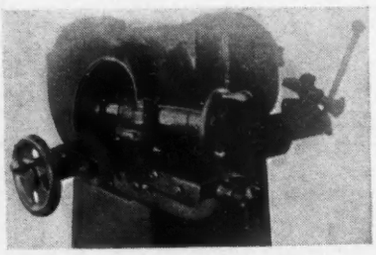
Unit pressure against cam surfaces is accomplished by providing a master cam for each cam lapping arm, thus controlling the movements of the arms and causing them to exert a uniform lapping action on each cam surface. Abrasive strips are held against cams by shoes of the proper size, the movement of which is controlled by the master cams.

To produce the proper finish, abrasive strips and supports are reciprocated in the direction of the camshaft axis while the camshaft is rotating and reciprocated with a slower motion. These motions result in the crossing and recrossing of the paths followed by the laps and produce the degree of finish required.

A separate set of lapping arms identical with those used for crankshaft lapping are employed for lapping the camshaft bearings. Cam contours and camshaft bearings are lapped simultaneously.



Detail view of crankshaft in Norton Crank-O-Lap machine with the arms raised. Lapping of each pin and bearing is done by the shoes of correct form which hold the abrasive strip against the surfaces to be lapped



Cutter disk grinding attachment applied to a Landis No. 1½ chaser grinding machine

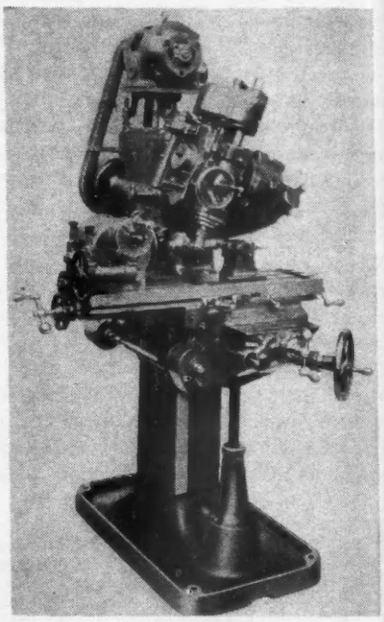
Grinding Attachment

Device for Resharpening Discs Used on Roller Pipe Cutter

A grinding attachment for resharpening cutter discs as used on a roller pipe cutter is being marketed by the Landis Machine Co., Waynesboro, Pa. The attachment is adapted for use on any Landis chaser grinding machine and was particularly designed for regrinding cutter discs used on the Geist roller pipe cutter.

By removing the steady rest in front of the straight wheel on the Landis chaser grinder, room is provided for bolting the disc cutter grinding attachment directly to the machine bed. The cutter disc is mounted on the end of a cutter shaft which is adjustable in a horizontal plane for obtaining any desired bevel on the cutting edge. A hand wheel on the opposite end of the cutter shaft permits revolving the cutter disc against the face of the grinding wheel in order to uniformly grind the circumference. In-feed is provided by means of a hand knob at the front of the attachment and cross traverse by the hand wheel at the left.

The attachment will take discs of 6, 7, or 8in. in diameter.

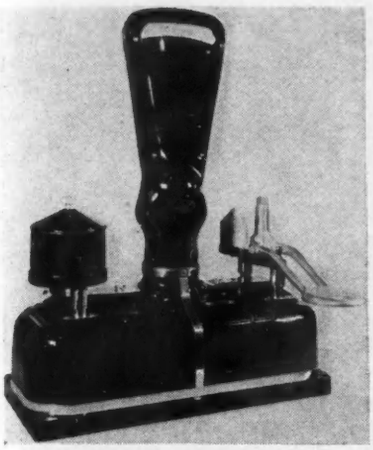


Cochrane-Bly improved universal vertical milling and shaping machine has spindle speeds up to 21 r.p.m.

Piston Standardizing

Toledo Scale Used With Machine Which Removes Excess Metal

An interesting piece of equipment is the piston standardizing device which has been developed by the Toledo Scale Co., Toledo, Ohio. Pistons



The piston standardizing device developed by Toledo scale

are machined to standard weight by either boring or by cutting off the skirt and this device is used in connection with a machine in which the cutter for removing metal from the piston moves up to a definite stop.

The piston is usually secured in a ring by a wrist pin, the ring and piston being placed on the platform, or arm which projects out from the side of the scale. Two movable jaws are arranged to clamp the ring and the piston.

The cutter moves up through the center of the arm on which the ring and piston are supported. Vertical movement of this arm is proportional to the amount of metal to be removed from the piston, and the scale is calibrated to register zero for a piston of standard weight. The platform moves down when a heavy piston is put on and the indicator shows the amount of metal to be removed. When the indicator comes to rest, the jaws are clamped together, holding the ring and piston in position, and the cutter moves up to cut off the proper amount of metal. When cutting is complete, the jaws open, and if the piston is of the correct weight the indicator will point to zero.

This device may be used in connection with the machine on which only one scale is used, or four scales may be mounted on a rotary machine with four spindles.

Milling and Shaping

Spindle Speeds up to 2100 R.P.M. With Cochrane-Bly Machine

The Cochrane-Bly Co., Rochester, N. Y., recently improved its universal vertical milling and shaping machine. The new model has a high-speed spindle which is mounted in anti-friction bearings and has ten right-hand speeds ranging up to approximately 2100 r.p.m.

The spindle, equipped with a sleeve to hold split collets from ⅛ in. to ⅝ in., can be furnished either with or without power down-feed, with four changes applicable to any spindle speed.

The radius tool attachment fits the shaper ram in place of the clapper block and will shape punches from the rough without undercutting. A punch located on the compound circular table can be machined on all sides, and from any center within a 5-in. circle, developing true radii, tangent and angular cuts accurately. Table settings can be duplicated when machining the die opening with a regular tool holder.

Milling and shaping heads can be adjusted to any angle from vertical to horizontal and 45 deg. front and back from center for drilling, milling, boring, shaping and slotting operations. The table can be arranged to receive a 10-in. universal dividing head.

Job Selector Dial

Device Facilitates Selection Of Correct Sawing and Filing Speed

An improved Doall contour sawing machine has been placed on the market by Continental Machine Specialties, Inc., Minneapolis, Minn.

A dual control dial is now built into the equipment. Somewhat similar to modern radio dial selectors, this dial lists 48 different materials. They are arranged in alphabetical order around the outer edge, beginning with aluminum and ending with zinc. The list includes several trade marked materials such as Monel metal, and all common metals and materials used in manufacturing. One blank space on the dial permits listing of another special material.

In addition to dialing the correct sawing and filing speed, the control also determines the correct saw to use for each material. That is, it shows the correct selection of saw as to "pitch," "temper," and "set' for each of the materials. Other improvements in this new machine are an improved lap grinder, a wider adjustment in the saw guide, and greater ruggedness.

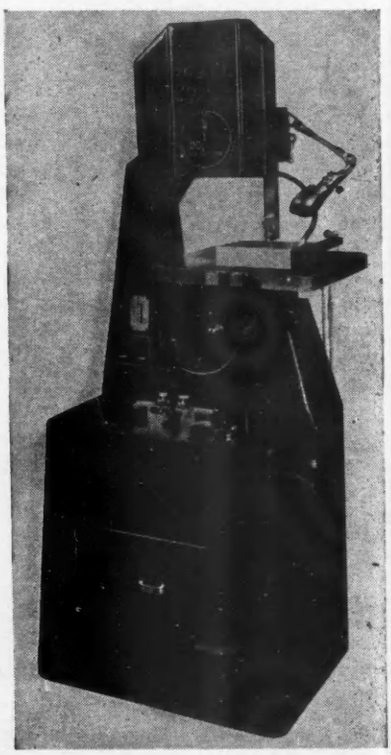
Turret Lathe

Millholland Machine Has Capacity For 1⅝-in. Round Bar

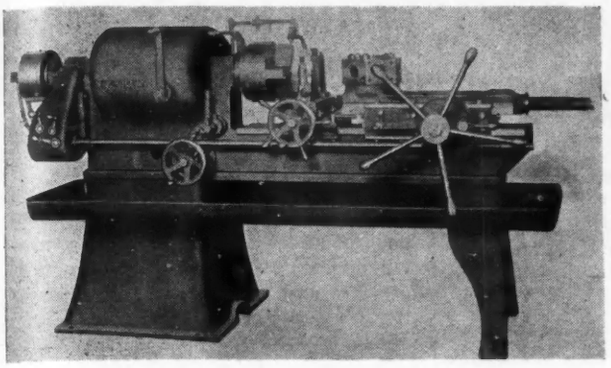
A new turret lathe with a capacity for 1⅝ in. round bar, a 9½-in. turret travel, and 16½-in. swing over ways, has been brought out by the Millholland Sales & Machine Co., Indianapolis, Ind.

The headstock has 12 speeds forward and reverse. In starting, stopping, reversing, and changing speeds, only two levers are used. One lever is used to obtain all 12 spindle speeds, the other operates the forward and reverse clutch and automatically brakes the spindle in neutral position of the clutch lever. Speed changes are made through sliding gears mounted on spline shafts, and range from 29 to 1000 r.p.m. The feed box is mounted on the front end of the bed and the 12 feed changes available range from .005 in. up to .136 in.

An alloy steel turnstile rack and pinion operate the turret slide. The hexagon turret is automatically indexed by the backward movement of the turret slide and automatically clamped by the forward movement. Tool holes in the hexagon turret have binder bushings for clamping round shanked tools and each face of the turret has four tapped holes for attaching flanged tools to the turret. Both the turret and turret stud are bored so that long stock can pass



Continental contour sawing machine with job selector dial



Milholland turret lathe with capacity for 1⅝-in. round bar, a 9½-in. turret travel, and 16½-in. swing over ways

through the turret. The turret feed is engaged by a large diameter friction clutch. Twelve feed changes available are automatically tripped by independent adjustable stops.

The power cross slide has twelve feed changes, reversible, engaged by a lever in front of the apron. It has automatic stops, operated by adjustable dogs which throw out feed in either direction; feeds can also be tripped by hand. A graduated dial is provided with adjustable clips for multiple shoulder diameters.

Automatic chuck and bar feed are operated by the long lever in front of the bed. With one movement, the operator opens the automatic chuck and feeds the bar, the reverse movement closes the chuck. A stepped wedge operating the chuck closing fingers automatically compensates for slightly varying diameters of work.

Tool Grinder

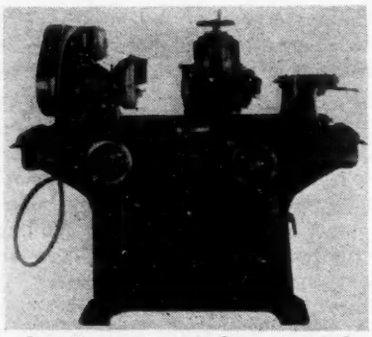
Machine Has 12-In. Work Swing and 28-In. Between Centers

A universal and tool grinder with 28 in. between centers and 12 in. work swing has been announced by the Landis Tool Co., Waynesboro, Pa. With standard equipment the machine may be used for surface and internal grinding operations in addition to external cylindrical operations. Extra equipment includes attachments for hob grinding, circular forming tool grinding, large saw grinding, staggered tooth gear cutter grinding, and other operations.

The wheel head may be swiveled 90 deg. in either direction, raised or lowered, and fed toward or away from the work. The headstock may be swiveled 90 deg. for face grinding, and it may be used for dead spindle or live spindle operation.

A motor mounted on the rear of the wheelhead drives the spindle by a vee-belt. Adjustable cap-type babbitt lined steel wheel spindle bearings are used. Vertical movement of the head is through a screw and nut arrangement. Weight of the column and head is counterbalanced so that the screw and nut action feeds the head downward against constant back-lash tension. Two motor pulleys and two spindle pulleys provide three different wheel speeds.

The multiple speed type headstock is provided with a constant speed motor. Three speeds are obtainable by shifting a single vee-belt at the left-hand end of the head. The number of available speeds may be doubled by changing the pulley on the right-hand end of the jack-shaft. The work spindle may be rotated for live spindle grinding or locked for dead spindle grinding.



Landis universal and tool grinder with 28 in. between centers and 12 in. work swing

The traverse drive is a self-contained gear box provided with four speeds. To permit traversing the table by hand, the power drive may be disengaged.

The universal head will hold milling cutters by their shanks, or mounted on arbors. It will also hold cutter bars which will receive work mounted on sliding shells. A taper shank mill sleeve supplied with this head is intended for the grinding of end mills held by their own shanks. The base is graduated a full 360 deg. and the head swivels 90 deg. either side of zero. There is also a vertical adjustment for the head.

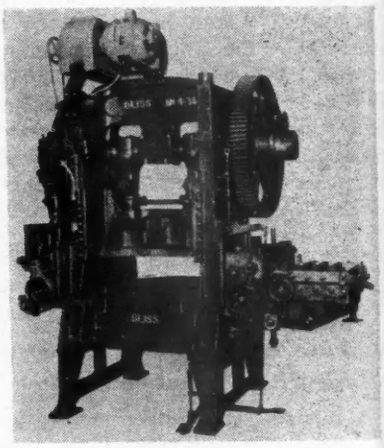
Blanking Press

Single Geared Bliss Machine Will Operate 30 to 90 Strokes Per Min.

E. W. Bliss Co., Toledo, Ohio, has announced a new design of its No. 4 high-speed automatic blanking press. The machine, although single geared, will operate from 30 to 90 strokes per min. through variable speed drive.

A magnetic line starter and a push button control the 5 hp. driving motor connected to the flywheel by vee-belts. High-speed rolling key clutch, locking pawl, and releasing brake are standard features.

Stroke of 1½ in. and adjustment of 3 in. has been provided. The shut-height bed to slide, stroke down, adjustment up is 11½ in., while the bolster is 4 in. thick with a 25-in. cored hole in the center. All main and connection bearings are bronze bushed, and the crankshaft runs on Timken roller bearings.



New Bliss high-speed automatic blanking press. Although single geared, the machine will operate 30 to 90 strokes per min. through variable speed drive

Some of the principal dimensions are: slide area, 28 in. by 31 in.; bed area, 34 in. by 35½ in.; 4-in. diameter of crankshaft at bearings; 6-in. diameter at connections; distance between uprights, 36 in.

A Bliss high-speed double roll feed, with a seven roll driven straightener and a shear type scrap cutter, with regular press gibbing, is mounted on the press. It is arranged to take coil stock 24 in. wide through openings in the housings. The upper blade of the scrap cutter can be adjusted to increase or decrease the cutting clearance. Feed rolls are 25 in. wide and the feed length is adjustable up to 25 in.